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ARCHIVES OF OPHTHALMOLOGY.

THE OCULAR MANIFESTATIONS OF EPIDEMIC ENCEPHALITIS.[1]

BY DR. WARD A. HOLDEN, NEW YORK.

WHAT is desired of me, I assume, is a comparative statistical account of the various eye symptoms found in epidemic encephalitis. In the extensive literature of encephalitis the eye symptoms noted in the various groups of cases differ considerably, according to the different observers. This difference, it may be, depends upon the mental condition of the patients and upon the observer's training in the examination of the eye and his facilities for examining the patient with the ophthalmologist's armamentarium, as well as upon the variations due to the personal equation.

Every ophthalmologist who has studied these patients in his examining room has noted relatively more cases of paresis of accommodation than are usually noted in the hospital groups, and he has doubtless diagnosed existing pareses of motor muscles of the eyeball more accurately. On the other hand, since these motor pareses are often evanescent and may have disappeared before the time of his examination, he may note fewer pareses, but obtain oftener a history of previous diplopia.

It has seemed to me that I could best serve your purpose by tabulating the eye symptoms from the case histories in institutions where great numbers of these patients have been carefully studied, and then commenting on the statistics so ob-

[1] Read before the Association for Research in Nervous and Mental Diseases, New York, December 29, 1920.

tained and on others already published and also on my own observations and some verbally reported to me by colleagues. Dr. B. Sachs and his associates in the Neurological Service of the Mount Sinai Hospital, where more encephalitis patients have been treated than in any other hospital in New York City, most kindly invited me to go over their case histories of the last two years, and with the assistance of Dr. Morris Grossman, I have collated the eye symptoms noted by them in a hundred consecutive, unselected cases. An analysis of twenty cases at the Neurological Institute showed very similar percentages. Hence in order to keep the figures equivalent to the percentages I shall speak of the Mount Sinai cases only, since they are sufficiently numerous to be representative.

The eye symptoms noted in one hundred consecutive case histories of epidemic encephalitis at the Mount Sinai Hospital are as follows:

A. Opticus Symptoms.—Blurring of the optic disks in 4, papillœdema in 1.

B. Oculomotorius and Abducens Symptoms.

1. *Ptosis.*—Of both eyes in 45, of one eye alone in 11,—in 56 patients in all.

2. *Extrinsic muscles of the eyeball.*

Paresis or paralysis of both external recti in 17,

of the right external rectus alone in 14,

of the left external rectus alone in 13,—in 44 patients in all.

Paresis or paralysis of both superior recti in 1, of both internal recti in 4, of the right internal rectus alone in 1.

Paresis of both internal and both external recti in 2.

Paralysis of all muscles supplied by one 3d nerve in 1.

Paralysis of conjugate dextroversion of both eyes in 2.

In all, weakness of the ocular motor muscles that would give rise to diplopia in 55 patients.

Nystagmus in 32 patients.

3. *Pupils.*—Irregularity in 15, inequality in 20. Sluggishness or absence of light reflex in 35 patients, in 13 of whom the convergence or accommodation reflex was sluggish also.

The irregularity and inequality of the pupils in 28 of the 35 cases were in eyes with sluggish pupils, so that irregularity and inequality not associated with sluggishness were noted but 7 times.

4. *Accommodation.*—Weakness of accommodation in both eyes in 1.

C. FACIALIS SYMPTOMS.—Weakness of some or all of the muscles supplied by the facialis of both sides in 24, of one side in 49—in 73 patients in all.

COMMENT.

The most marked divergence I have found from these percentages is in the carefully studied 8 cases of Barker, Cross, and Irwin (*Amer. Journ. Med. Sciences*, cliv., 2–3). They found partial ptosis in 3, sluggish pupils in the entire 8, and weakness of accommodation in 4. Their reports on the recti muscles are less specific.

The percentages in the thirty histories reported in Tilney and Howe's book *Epidemic Encephalitis* are similar to the Mount Sinai Hospital percentages except as regards the recti muscles. Tilney and Howe found the *internal* rectus paretic much more frequently than the *external*.

OPTICUS SYMPTOMS.—There was noted in four patients at the Mount Sinai Hospital a blurring of the optic disks and in one a definite papillœdema.

The earlier reports on encephalitis referred in many cases to blurring of the disks. But we recognize that a slight œdema and a reddening of the disks due to dilatation of the capillaries, with overfilled and perhaps tortuous retinal veins, is a fairly common condition when the general circulation is sluggish. In such cases a subsequent examination is made and if the condition remains unchanged we do not regard it as a beginning papillœdema and we are strengthened in this belief when the patient complains not of headache and vomiting, but merely of cold feet. It is possible that some of the cases of blurred optic disks reported may have had but little significance.

True papillœdema was noted in one Mount Sinai Hospital patient and was found in one of the twenty at the Neurological Institute. The latter patient, a child three years of age, had meningeal symptoms, paresis of both external recti, paresis of the right facialis and right hemiparesis, with papillœdema of two and a half dioptries elevation in each eye. She made a complete recovery. In another case with papillœdema, ver-

bally related to me, there was found at the autopsy an extensive subcortical hemorrhage in the parietal region which had caused hemiplegia.

True papillœdema then is a very rare symptom of encephalitis and seems to occur only where there are unusual complications. This papillœdema is doubtless the result of increased intracranial pressure in most cases, although in some cases it may be due directly to meningitis.[1]

OCULOMOTORIUS AND ABDUCENS SYMPTOMS.—Inflammatory changes have been found widespread in the brain, but with great frequency in the brain stem, consisting of œdema, hemorrhage, proliferation of neuroglia, circumvascular exudation of leucocyte-like cells, and degeneration of ganglion cells. The meninges also are frequently inflamed. From this it is evident that there may be pressure upon the nuclei of the ocular nerves, upon the supranuclear and infranuclear fibers—direct and association—and upon the trunks of the nerves at the base of the brain. This pressure may be transitory or permanent, slight or destructive, or even alternating and recurrent. It is obvious that clinically one must find in this disease all degrees

[1] C. P. Symonds in a paper on "Optic Neuritis in Encephalitis Lethargica," *Lancet*, Dec. 18, 1920, after describing four cases studied at the Johns Hopkins Hospital, gives as one of his conclusions the following statement: "In the association of optic neuritis with acute disseminated myelitis we have an instance of involvement of the optic nerves in a diffuse inflammatory process affecting the nervous system, which is analogous to the association of optic neuritis with encephalitis lethargica."

In these ARCHIVES, vol. xl., No. 6, and vol. xliii., No. 3, I described five cases of optic-nerve affection in acute disseminated myelitis. In this disease the affection of the optic nerve is a localized inflammation about certain blood vessels in the nerve. There is, as a rule, no elevation of the disk and there ensues a partial or general pallor of the disk, with marked disturbance of vision. In three of the four cases in which visual tests could be carried out I found a lateral hemianopic defect in the field of one eye only, which seemed to me characteristic of the disease, and in one case an excessive concentric contraction of the field of one eye.

The reports of optic-nerve disturbances in epidemic encephalitis lethargica with which I am familiar, including those of Symonds, show little in common with the optic-nerve disturbances I have seen in acute disseminated myelitis. Therefore, until anatomical proof to the contrary is presented, I prefer to regard the optic-nerve disturbances of epidemic encephalitis as being chiefly of the papillœdematous type due to increased intracranial pressure, rather than of the retrobulbar inflammatory type, as Symonds would seem to suggest.

of muscular palsy and all possible combinations and varieties of palsy of the third and sixth nerves, with changes from week to week.

In general, in this disease, we find a disinclination to use the eye muscles or a quick fatigue and return to the position of rest after using them, even when there is no well marked paresis. In this, as in many disturbed mental conditions, the patient may dislike to look up and may simulate paralysis of upward movement unless repeated tests are made.

Ptosis.—In the lethargic state the patient may lie with his eyes closed in the position of rest and often cannot be urged to keep them open, or even to open them wide for a moment. This may be due to a mental disinclination, to photophobia, to a dread of diplopia, or to a spasm of the orbicularis palpebrarum muscles, as well as to weakness of the levators. When he can be urged to open his eyes a difference in the width of the palpebral apertures may be seen or a drooping of one or both upper lids may be noted, but except in the unusual cases of complete third nerve paralysis, complete ptosis is not likely to be present. In other cases the eyes are kept open, but winking is infrequent. Forcible closing of the eyes often leads to a marked tremor of the lids, for tremor is a very constant symptom of encephalitis. When one eye has been kept closed a few days to prevent diplopia its palpebral aperture will be narrower than that of the other eye when both are opened One can easily realize that the question of ptosis in a given case may admit of a variety of answers. Ptosis was noted in fifty-six of the Mount Sinai Hospital patients.

Extrinsic Muscles of the Eyeball.—Certain brain affections have rather definite paralyses of the ocular muscles which are pathognomonic. Thus after diphtheria there may be paralysis of accommodation on both sides without pupillary disturbances; in botulism there may be ophthalmoplegia interna on both sides—that is, iridoplegia and dilatation of the pupil with paralysis of accommodation; in polioencephalitis superior the two internal recti are first paralyzed and later often one or both external recti; in destruction of one abducens nucleus there is conjugate paralysis of dextro- or sinistro-version of the two eyes; in red nucleus involvement there is loss of upward movement of the eye; and with exudation at the base of the

brain both sixth nerves or both third nerves in some or all of their branches may be affected.

In epidemic encephalitis almost all of these paralyses are found. And if there is anything at all characteristic it is the ***frequent association of ptosis with paralysis of the external recti.*** In the Mount Sinai Hospital group there were twenty-three patients in whom paralysis of one or both external recti (without accompanying paralysis of internal recti) was associated with ptosis of one side or both. This is a combination of third and sixth nerve affections that is rarely met with in any other disease.

The fourth nerve doubtless is affected at times in encephalitis, although paresis of the superior oblique muscle has not been noted in any reports that I recall. This may be because a paresis of the superior oblique might easily be overlooked in a lethargic patient, and even in a mentally alert patient it might escape notice when masked by more obvious palsies of other motor muscles.

There is a curious condition, of whose pathology we are ignorant, known as paralysis of divergence. In this condition there is neither paralysis nor spasm of the recti muscles and the mobility of each eye is normal, but the eyes are converged on a point some 15*cm* away and see single at this distance, while at greater distances there is homonymous diplopia in every direction of the gaze. The ætiology of this condition is obscure and the lesion is supposed to lie in a purely hypothetical divergence center. I have seen it in midbrain tumor and in uræmia. This paralysis of divergence was one of the earliest symptoms in a patient with encephalitis whom I saw privately, and two colleagues have told me that they had found the same condition in encephalitis patients, so probably it is not very rare if carefully sought for; and study of the cases in which it is present may lead to our better understanding of the condition.[1]

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[1] In some cases, paralysis of divergence has either preceded or followed paralysis of one external rectus, suggesting that the site of the lesion in this condition lies near the abducens nucleus.

It would be natural to assume that there is a break in the association tract between the abducens nucleus of one eye and the nucleus for the internal rectus of the other eye. However, we believe that the impulse which turns both eyes to the right arises from the right abducens nucleus. And if

The course of these palsies is not uniform; often they disappear in a few days, sometimes they are permanent, sometimes they are recurrent. In general we may say that diplopia disappears early, ptosis later, and pupillary anomalies and weakness of accommodation last of all the eye symptoms, many months after the onset.

Nystagmus.—There may be the slight nystagmus of asthenic states or the pronounced nystagmus of organic brain disease. Very frequently too there are the nystagmoid twitchings in the direction of action of a muscle that is paretic. One variety of irritative spasm that has been described to me is a lightning-like oscillation of the two eyes, without parallelism of action, coming on at intervals when the eyes are in the position of rest. These different varieties have not been differentiated in our figures, but nystagmus was noted in 32 of the Mount Sinai patients.

Pupils.—In 35 of the 100 patients there was defective light reaction of the pupils, often with irregularity and inequality. As a rule in encephalitis the sluggish pupils are small or of medium size. They differ from the pupils of cerebral lues only in the greater frequency of an accompanying defective convergence reaction. The characteristic pupils of cerebral lues are seen also at times with tumors and non-luetic inflammations in the brain stem. In encephalitis this symptom is very common. Barker finding it in every one of his reported cases.

This is not the place to discuss the mechanism and manner of production of the Argyll-Robertson pupil, but it is hoped that study by neuropathologists of these brains with inflammatory changes still fresh may solve some of the unsettled problems.

In lues, if there is a paresis of accommodation there is also dilatation of the pupil and iridoplegia—an ophthalmoplegia

this impulse were sent from the abducens nucleus in normal measure to the right external rectus and incompletely to the left internal rectus the result would be divergence of the two eyes and not the convergence which is found in these cases. Could we assume that the impulse which turns the eyes to the right arises from the nucleus of the left internal rectus, an interruption of the association fibers in the longitudinal fascicle would prevent the full impulse from reaching the right external rectus and thus lead to convergence of the eyes. But since this assumption seems untenable, our attempts to solve the problem with our present data are purely speculative and vain.

interna. A peculiarity of encephalitis pupils is that in many cases there is a paresis or even complete paralysis of accommodation without dilatation of the pupil—in other words there is a normal pupil or an undilated Argyll-Robertson pupil plus the paresis of accommodation that formerly we saw as an isolated symptom in diphtheria alone. This paresis of accommodation in encephalitis, furthermore, is usually bilateral, whereas in lues it is mostly found in one eye only.

The characteristic features of the sluggish pupil found in encephalitis then are, first, the great *frequency of accompanying defective convergence reaction*, and second, *the association often with paresis of accommodation without dilatation of the pupil.*

Accommodation.—Accommodation may be apparently normal by the tests, yet the patient may not be able to maintain it for a length of time, that is, there is quick fatigue of accommodation, or there may be various degrees of actual loss of accommodation. When there is actual loss of accommodation the hyperopic patient, who is accustomed to overcome his hyperopia by exercising his accommodation, finds that his distant vision has suffered as well as his near vision. And the emmetropic patient finds that he can read print only with great effort and by holding it at arm's length. This paresis of accommodation may easily be overlooked in the bed patient, but the ophthalmologist finds it frequently in the convalescent.

FACIALIS SYMPTOMS.—The facial palsy is for the most part slight and often limited to the lower branches. It is rarely sufficiently pronounced to give rise to lagophthalmos or even to cause difficulty in closing the eyelids.

In conclusion I might say that since the eye disturbances of encephalitis are sometimes of early onset and then the most annoying of the patient's symptoms, the ophthalmologist may be the first physician to be consulted and in times of epidemic he may from the eye symptoms alone, if lues can be excluded, make the diagnosis.

ON BACKING OUT OF CATARACT OPERATIONS[1]

By Dr. H. GIFFORD, Omaha, Neb.

THIS paper is offered as an attempt to indicate the best way out of a bad hole. The hole referred to is the position in which an operator finds himself when, on completing the incision for a cataract expression, the vitreous begins to escape before the lens is expelled. In this position he knows that to attempt to expel the lens by pressure means failure with almost certain loss of the eye. On the other hand, if he extract the lens with hook or loop a good deal of vitreous is almost certain to be lost, and while in many such cases the result is fair the average result is, to say the least, poor. The writer has been gradually reaching the conclusion that unless, to prepare for this contingency, he has previously dissected up a large conjunctival flap and inserted stitches with which this flap can be quickly brought down to reduce the escape of vitreous to a minimum, the only justifiable procedure is to back out, that is, to interrupt the operation, desist from any attempt to remove the lens, allow the incision to heal, and to deal with the cataract later on by some safer method. The writer confesses that at the bottom of his conclusion is a holy horror of extensive loss of vitreous. This is not founded on any especially bad record in this respect. In the course of 35 years' practice I have never lost but two eyes directly from loss of vitreous, and I have fished out many a lens with fair or even excellent results. But in contrasting the results of cases in which considerable vitreous has been lost, with those of other cataract operations, I feel positive that if I were the patient, in such a hole, I should in-

[1] Read before the American Academy of Ophthalmology and Oto-Laryngology, Kansas City, October 14, 1920.

sist, if the choice were offered me, on trying the interrupted operation; and where the patient has only one eye, I consider it to be the operator's imperative duty, when confronted with this dilemma, to stop the operation. You may ask: If it is right to do this where the patient only has one eye, why is it not right to adopt the same plan when he has two eyes? To this I can only answer: Why not?

As to the means which should be adopted to get rid of the lens after the first operation has been interrupted, three courses are open. One is to neglect the cataract until the second eye has been operated on; leaving it to the patient whether, after this, another attempt should be made with the first eye. The second is to get rid of the lens by repeated discissions. The third is to prepare for loss of vitreous by dissecting up a large flap, as indicated above, and to complete the removal of the lens by extraction with a loop or hook after the ordinary incision. The writer has tried all three of these plans with greater or less success.

CASE I.—E. L., aged 48, lost all sight in the left eye fifteen or twenty years before, through some form of vascular degeneration. The right eye on November 22, 1912, had a cataract two thirds ripe and progressing very slowly; V = $\frac{5}{200}$, projection good. On November 23, 1912, preliminary capsulotomy made; and as this produced very little result, another capsulotomy was made on December 4, 1912. On December 28, 1912, an ordinary cataract incision was made in the limbus and a small iridectomy was done. On completing the iridectomy, the anterior chamber, instead of remaining empty, filled with fluid vitreous, which escaped in a slow, steady stream from the incision. Confronted with the alternative of removing the lens with a hook or loop, with the probability that this would cause so much loss of vitreous as to seriously endanger the patient's only eye, or of backing out, I decided that if I were in the position of the patient, I should want the surgeon to back out and to do it quickly. So I interrupted the operation, and without disturbing the lens, allowed the incision to close. After a lapse of three months I started again in the attempt to get rid of the lens by repeated discissions. I did the first of these on March 26, 1913, the second on May 16, 1913, and on the day following the nucleus was found in the anterior chamber showing a nearly clear pupil above. On June 24, 1913, vision with correcting glass was $\frac{3}{60}$. The nucleus was allowed to

remain in the anterior chamber, gradually getting smaller; and finally after a year and a half, it disappeared entirely.

During this time his vision varied from $\frac{20}{60}$ to $\frac{20}{40}$ and at times he would have quite sharp attacks of pain with some congestion. These finally ceased, however, and his vision remained at about the same level until January, 1917, when a detachment of the retina developed and the sight was gradually lost.

Not an especially brilliant result, but in view of the tendency to degeneration which both eyes showed, I am quite certain that the man obtained five years of useful sight which he would not have had if I had completed the removal of the lens at the first operation.

CASE 2.—G. T., aged 34; had lost right eye as the result of a cataract operation done when he was a child. The left eye had been under my observation since 1907. At that time it had myopia of 18 D. with numerous vitreous opacities and some atrophy at the center of the retina and V. with correction $\frac{20}{30}$. On October 7, 1913, he came to me with a somewhat shrunken hard-looking cataract in the left eye. This looked so tough that I decided erroneously that discissions would probably help it very slowly if at all; so I started to do a combined expression; but on completing the iridectomy, fluid vitreous escaped at such a rate that I made no attempt to express the lens but allowed the wound to close and, after repeated discissions, I obtained by September 13, 1915, a clear pupil with the nucleus lying at the bottom of the anterior chamber as in Case 1. It gradually disappeared without causing any disturbance. Vision with correction, $\frac{20}{200}$, which he has retained to the present time.

CASE 3.—(Record mislaid.) J. S., aged about 67. Right eye lost many years before. Left eye complete cataract following blow from a chip of wood some months before. Pupil somewhat irregular from slight iridodialysis. Iris not wobbly, projection fair. Started to do a combined expression. On completing the iridectomy vitreous appeared in the wound, operation interrupted; wound allowed to close without disturbing the lens. Treatment of cataract by repeated discissions begun after about two months. The cataract was absorbed very slowly, but at the end of a year the pupil was clear enough to allow a good view of the fundus, when it was found that the nerve was atrophic. The sight was only fingers at two feet. A poor result which would have been good if the nerve had held out.

Besides these one-eyed cases, in which the necessity for backing out of the operation, in order to increase the patient's chance, was rather obvious, I have, for the same reason, backed out of cataract operations with eight two-eyed patients. In two of these the *second* eye was successfully operated on in the ordinary way and nothing further was done to the first eye. In four cases, at the second operation, preparation to limit loss of vitreous by a sliding flap was made; and the lens was removed either by expression or by extraction. The immediate result, in all these cases, was good; the astonishing thing about them being that in two of the cases which had shown prompt and indubitable loss of vitreous at the first operation, there was not the slightest sign of vitreous loss at the second operation; the lens being expressed in the ordinary way without difficulty. In one of these patients the sight of the eye was subsequently lost by detachment of the retina; but this can hardly be charged against the method adopted, since if the detachment were in any way due to the removal of the lens, it would have certainly been much more apt to occur if the lens had been extracted, with the inevitable greater loss of vitreous, at the first operation. In the seventh case, the lens was cleared up by repeated discissions, with vision $\frac{2}{3}\frac{0}{0}$. In the eighth patient the method of frequent discissions is being carried out with such slow progress toward absorption that I am beginning to doubt whether it will not be best to remove the lens with the sliding flap preparation.

Besides these cases in which the reason for interrupting the operation was actual loss of vitreous, I have beaten a retreat in some other cases; either because the incorrigibility or the stupidity of the patient made it evident, in the early steps of the operation, that the danger of loss of vitreous would be decidedly greater than the average and ought to be met with special preparation; or because of some accident or oversight in the ordinary preparatory measures. As an example of the latter contingency, I may cite a case in which with the patient on the table, a nurse handed me a hypo half filled with pure carbolic acid instead of the cocaine solution which I wanted. I put three drops of this in quick succession on the center of the cornea before discovering the mistake. Luckily plenty of alcohol was right at hand and after using it very freely, no

harm resulted; still I thought best to call this a "preparatory operation," and to postpone the expression of the lens for a few weeks, when it was done with a perfect result.

In another case the patient behaved so badly that after doing the puncture and counterpuncture, I decided that to finish the operation without losing half the vitreous would require a special dispensation; so I desisted without completing the incision and have had no opportunity to do anything more for the patient. If he returns I shall have to do his operation under ether.

The necessity for backing out on account of the behavior of the patient can be largely done away with if the practice is followed of always making the patient come to the table with an empty stomach. If he then reveals himself as an obstructionist or a hopeless squeezer, all that is necessary is to give him a general anæsthetic and do the operation in peace and quiet. I don't pretend to follow this rule, but I am convinced that it is a mighty good one; and after any of you have done an expression under a general anæsthetic with fixation by the tendon of the superior rectus, I venture to predict that you will begin to wonder whether it wouldn't be a good thing to do all your expressions in this way. Of course I do not wish to even suggest that this should actually be done in all cases, but there is no doubt in my mind that there is a wider field for general anæsthesia in cataract operations than is generally accepted.

Another way to help avoid the necessity of backing out would be to make more general use of repeated discissions as the primary method in place of expression. It is now evident that in at least two of my cases this would have given a good result with no more delay than is frequently necessary in children. But the difficulty of judging which cases are suitable for this procedure will necessarily limit its use.

Another plan to avoid many of the occasions for backing out, is to do all peripheral expressions with a sliding flap. It is a very good plan to follow. Some years ago,[1] I reported a series of about 130 expressions done in this way without a single loss and with good results in all but two cases, in both of which the visual result was due to anteoperative complications. I never

[1] *Annals of Ophthalmology*, January, 1916.

had a better series, and my only reason for discontinuing it as a routine practice was that it took about twice as long as the ordinary operation. But even if one does not adopt the sliding flap as a routine measure, there can be no doubt that when the condition of the eye or the disposition of the patient leads us to expect an unusual amount of trouble, the sliding flap should be used.

As to the psychology, both of the patient and of the operator, in such cases, a word may be worth while. Starting with the self-evident proposition that under no possible contingency should the interests of the operator outweigh those of the patient, we must admit that human nature will not let us crowd our own interests entirely out of sight. We would never think of deliberately sacrificing any advantage for the patient to save our own pride, peace of mind, or our purse; but when it comes to deciding, on the spur of the moment, to disappoint the patient and his friends and perhaps have him go off and get a successful result at the hands of someone else, for a purely hypothetical advantage, the decision may not be so easy. Personally, I have never had occasion to regret backing out of one of these cases. In all but one, the patient, when the condition has been explained, has gladly accepted the situation and has felt grateful for the extra solicitude shown for his welfare.

The disposition and experience of the operator will naturally play a large part in forming the decision as to whether any of the emergencies mentioned above demand an interruption of the operation; but in any given case the operator can hardly go wrong if he adopt the plan which he would want followed if he were on the table instead of at its head.

ON METHODS OF DEALING WITH THE CAPSULE IN CATARACT EXTRACTION.[1]

By Dr. ARNOLD KNAPP, New York.

THE one step in the operation for senile cataract on which there is still the most divergence of opinion is the manner of dealing with the capsule. I have therefore selected this phase of the subject for my topic in the discussion of this evening. The method of treating the capsule depends, in my opinion, on two factors, the patient and the kind of cataract. This can be expressed in another way as follows: The three procedures, the cystotome, the toothed capsule forceps, and the blunt capsule forceps, are proportionate steps, both in ease of execution and in success of obtaining a clear pupil according to the behavior of the patient and to the kind of cataract.

I am assuming that an iridectomy is always performed in the operation for senile cataract. The cystotome is the easiest instrument to handle of these three procedures; it is the instrument of choice for less experienced hands and the instrument of necessity in badly behaving patients. There are many ways of lacerating the capsule with this instrument. The guiding principles are ease of delivering the nucleus and cortex, the avoidance of dense cicatricial bands which make the subsequent discission difficult and the avoidance of capsular tags healing to the corneal wound, with subsequent glaucoma. These conditions can be best met by the peripheric linear incision of which my father was a firm advocate. The addition of a vertical incision as suggested by v. Graefe allows freer access of aqueous to retained cortex and gives less tendency to

[1] Read by invitation before the New England Ophthalmological Society, Boston, December 22, 1920.

a closed bag of capsule, though the opening does not always stay open as it theoretically should and the resulting thickened vertical band of capsule is difficult to divide except with a scissors at the so-called secondary or needling operation. Multiple lacerations are bad, as they lead to inclusion of capsule in the corneal wound and irregular thickened bands in the after-cataract.

The toothed capsule forceps is a more difficult instrument to handle. With its sharp teeth it cuts its way through the capsule, often without tearing away enough to leave a good opening; it is difficult to tell how large an opening has been effected and it is the custom of some operators to add the cystotome maneuver. In this procedure it is also important to avoid inclusion of capsule in the corneal scar and it is important to stroke back capsular tags in completing the toilet of the cataract eye. Secondary glaucoma also results from the torn margin of the anterior capsule becoming adherent to the posterior, thus shutting off cortical remnants, which subsequently swell and by pressing forward the root of the iris, obliterate the iris angle and cause secondary glaucoma. This occurs some weeks after the extraction, particularly in operations on immature cataracts with some cyclitic reaction. A case in point is that of F., aged 53, who was operated on for immature cataract on June 29, 1920. The blunt capsule forceps was used, the capsule tore, the cataract was successfully removed with vision of $\frac{1}{10}$, clear pupil, some cortex up and out. On July 28th, one month later, patient developed glaucoma. Neither the iris pillars nor the capsule were caught in the corneal section, but while the iris below was flat it was bulging over both pillars, more on the temporal than the nasal side. An iridectomy was done up and out, which included the temporal iris pillar, the retained cortex was stroked away; the margin of the other pillar was found glued to capsule and was freed with the spatula. Recovery was uneventful, with cure of glaucoma and ultimate vision of $\frac{1}{10}$.

The third procedure is that with the blunt forceps, which I use in all cases if the patient's behavior is good. This forceps is the one devised by Kalt in Paris, which consists in a bifurcated cup-shaped extremity without teeth. Its application requires a certain amount of practice and the more the tip of

the forceps engages in the capsule, the easier it takes hold, and on the other hand, the more likely is the rupture of the capsule. The advantage of these forceps is that a firm grip is possible with less danger of cutting the capsule; it is thus possible to dislocate the lens, or failing in this, to rupture the capsule at its periphery and not directly at site of contact. In this way a large piece of capsule can be removed, which often includes the entire anterior capsule. The point of application is at the lower pupillary margin, or even beneath the pupillary margin, opening up the branches as wide as possible; the larger the knuckle of capsule grasped the less likely does it tear and the more likely is the lens subluxated. The grip must not be too tight and no sudden movement or twist made. In this maneuver the lens in its capsule is freed from its lower attachment in a certain proportion of cases, depending on the kind of cataract and the state of the capsule, provided the patient's eye remains quiet. It is a matter of experience that the more hypermature the cataract, the easier is the dislocation. It is not likely to occur in patients under 50. The amber, sclerosed lenses which are often nuclear and immature dislocate easily; the smooth capsule, especially with "asbestos sheen" cortex, does not. On the other hand, the Morgagnian cataract with fluid cortex is very difficult to grasp unless the blades of the forceps are opened wide enough to grasp the lateral margins. After the cataract is dislocated, which is recognized by the lower margin appearing in the pupil, the forceps are released and extraction in the capsule proceeds according to the Smith technique.

In some cases, though the capsule is firmly gripped, it is too elastic to give away; in these cases it is not wise to persist and it is better to let go and adopt one of the other methods, or, after first making a vertical lateral cystotomy the capsule is seized with the blunt forceps.

It is not necessary to rehearse the desirability of removing a cataract in its capsule; our aim at the present day is to attain this in whatever way it can be accomplished with the greatest safety. I have been following the above described method for ten years and am about to give a detailed report on the second consecutive hundred extractions in the capsule. I shall not go into a consideration of these results now, but wish to present

the subject from the viewpoint of the relative frequency of the various procedures, based on a study of my last three hundred consecutive cataract operations.

				Vitreous
Total number of consecutive extractions	300			
Blunt forceps	214			
Capsule ruptured		125		
Extraction in capsule		89		8
Capsule ruptured during delivery			3	
Unable to grasp			7	
Unable to dislocate though grasp was firm			4	
Toothed forceps	51			1
Cystotome	35			

This shows that extraction in the capsule was effected by this method in 42%; this number is too small because among the cases in which the capsule was ruptured in applying the blunt forceps, in some, a rupture was purposely attempted and a dislocation was not desired, though this, I find, was not always stated in the hospital records. A rupture of the capsule occurs particularly when the point of the forceps is applied, a small piece of capsule only is seized and a quick, twisting movement made. The percentage of cases of rupture of capsule during delivery was less than 3%. The percentage of vitreous loss was 9%. In the cases where it is not possible to grasp the capsule (seven in number), the blunt forceps slipped without taking hold on one or two attempts and the method was abandoned. In four the grasp was firm but the suspensory ligament seemed unduly elastic and traction was not persevered in for fear of causing a cyclitic reaction, as it is not known how much traction the ciliary processes will bear.

This method of extraction in the capsule has been taken up by others and has been modified both in the blunt capsule forceps and in its application. The chief modification is the one suggested by Török at our hospital, which consists in the following: After gripping the lens capsule with the blunt forceps, pressure is applied to the eyeball below the cornea and the cataract is drawn out with the capsule forceps in situ. As this method is being practiced by a number of the members of this society I have gone over Dr. Török's cases in the hospital records with his permission during this same interval of time, with the following results: The percentage of successful dis-

locations was 59%; the number of ruptures of the capsule during the process of delivery was 12%. Rupture of the capsule during delivery is an unpleasant complication, as it requires the removal of the separate capsular bag, which is often difficult, especially in the presence of vitreous escape. The percentage of vitreous loss was 13%; it is my impression that the amount lost is also greater in the latter series, moreover the vitreous escape occurs at an earlier period in the extraction, while in my series the vitreous loss occurred at the end of the extraction and did not materially depreciate the ultimate vision or the healing of the wound.

While I personally prefer the process of tumbling, as it is the safer method, according to Colonel Smith's vast experience, the Török method succeeds in dislocating a larger percentage of cataracts. A study of these results suggests a combination of these two methods. This would consist in grasping the lens capsule at its lowest part, moderate traction is then exercised in different directions with simultaneous external pressure with the Smith hook at the inferior margin of the cornea until dislocation below has taken place, release of the forceps and of pressure, then proceed to extract the partly subluxated lens by external pressure, causing the cataract to tumble and to be delivered feet first, according to the Smith technique.

OBSERVATION, MANAGEMENT, AND TREATMENT OF THE CATARACT PATIENT BEFORE AND AFTER OPERATION.[1]

By Dr. WALTER H. SNYDER, Toledo.

THE care of cataract should start, if possible, months before the actual cutting is done.

It is very necessary to get a careful history, not only of the immediate ancestry but the collateral branches. When this is done it will be found that many in the same family history will report cataracts, and it is becoming a matter of common knowledge that these diseases of the lens seem to run in certain families. This part of the history is not necessary for the good of the patient but that we may have some exact knowledge of the condition under which it arises.

The personal history should be carefully taken letting the patients drift along giving their expression with as few suggestions as possible and then rearranging them in chronological order for the permanent written history. I think it is a necessity that a Wassermann should always be made. At present we are also having blood chemical analyses made on all these cases but cannot report its value at this time. The aged often retain products in the blood far in excess of normal and it is possible that it may be very detrimental in eye surgery as we know it is in general surgery. A history of stormy eye-sight in childhood, following measles, will frequently be found and there seems to be a disturbed visual function during the entire life of many of those who are to wind up with the condition that we call cataract. Especially should glasses be neutralized

[1] Read before the Eye, Ear, Nose, and Throat Section of the Ohio State Medical Association, at Toledo, June 1, 1920.

that they have used, and we should inquire how satisfactory they were, how frequently changes were necessary, what attacks of inflammation they have had, when they first noticed the failing of vision, how rapidly it progressed, what form it took, what intercurrent diseases occurred at the time, and it is surprising how elaborate a history can be gotten out along the exact lines which can now be well defined.

The most important single thing to observe of the personal examination is the condition of the pupil, and its reaction to light. This, of course, tests the entire visual arc and is one which is of the greatest importance in patients who speak a language we do not understand. The quick prompt acting iris leads one to know the condition of the fundus almost as well as any test could tell us, but where it is possible we should make finer and more delicate tests of light perception and projection. By this I mean using a small light 5 or 10*mm* in diameter in a dark room and standing at a distance of five to ten feet and having the patients point towards the light, shifting a few inches at a time, up and down, right and left. This would give you an excellent idea of the presence of macular scotomas which sometimes have been found to render the post-operative vision almost useless after a beautifully executed operation. The patient who cannot perceive nor project accurately the position of the light, must be warned that the operation will not result in as good vision as he desires, although worth while. This all has to do more with the prognosis of the operation than its successful completion.

The next thing we examine is the condition of the cornea for fine scars or opacities, all of which may be hardly noticed by a patient with an already partially cataractous lens but which when we come to fit glasses for normal vision will cause a serious reduction in the vision.

The next thing is to examine the lacrimal apparatus and drainage of the eye. This usually is patent enough for surgical purposes but one should determine this as positively as can be done by fluorescin or argyrol, staining the handkerchief or by flushing the eye after dilating the puncta which in cases which need conjunctival treatment should always be done. The rapidity with which a conjunctival infection clears up after dilating the puncta is very noticeable over the ordinary treat-

ment. When we first see a cataract case we dilate these puncta, treating them with a weak solution of silver (one grain to the ounce), and then have them use hot applications followed by flushing with a boric solution.

The whiter the eye and less congestion in the lids, the better the result that may be expected from the surgical side. The tension is taken and the scleral toughness of age is not confused with the increased tension of chronic simple glaucoma. I am not a believer in operating on new cataract cases the day they are first seen or even a few days after. Most of them would be benefited by a course of treatment which includes a reasonable study of their excretions and hygienic habits.

While the presence of sugar in the urine does not contradict the operation, it is well for the surgeon to know it and I have no hesitation in operating on cases which have shown four and five per cent. of sugar but I wish to choose my time for the operation. The use of glycerin in the eye to relieve the congestion has been useful and in many cases clears up the anterior congestion very quickly.

We will suppose now that the patients have been properly instructed in the care of the eye and we have decided to do the operation at a certain date. My habit is to have my patients in the hospital a day or two before the operation and if they wish the operation done without their knowledge, we require usually a week for this. During this time the night nurse observes their sleeping qualities, coughing, restlessness, what sort of a bed they are most comfortable in, and their general reaction to the environment of a hospital. It is my custom to operate in a special bed in the room or ward of the patient and they are trained in this, either by my nursing assistant or myself, to do the ordinary things demanded during the operation. A sign is displayed on the door to ensure quiet. The strong psychological feature of their training is that it will not pain them, that they will not be injured in any way, and that they can successfully do all that is required of them. If they are to be operated on without their knowledge, there is a long line of treatment adopted which I shall not speak of here but ordinarily, especially if the preliminary iridectomy is adopted, they are given a day or two to become acquainted in the hospital, and then the operation is performed in bed. The face is thor-

oughly scrubbed, the hair and eye brows trimmed and in women the hair braided in a queue centering on top of the head. The face washing in some patients is done on entrance and repeated.

I usually order a drop of atropin, solution 1 per cent. one hour before the morphine.

It is our custom to give them an average dose of morphine about an hour before the operation. We have tried many of the drugs used for this and have finally decided on morphine and atropine as the best combination for our purpose.

During all the time that patients are in the hospital, the hot applications are kept up and occasionally the conjunctiva is touched up with silver solution and they are not put to bed until a few minutes before the time for their morphine.

I cannot impress too strongly upon my audience the necessity of completely winning the confidence of the patient. Unless this is done by a certain amount of familiarity with the doctor and his methods, they will resist or attempt to rely upon their own resources which is apt to mean a squeeze or shrinking from the technique and probable loss of vitreous. We do not tell the patients they are being trained for the operation when we ask them to open the eyes, to look upward or look downward, to close them gently, to keep them closed, to allow us to put the speculum in and flush the eye without holding their breath, but this is the effect which it has upon them and those who have used this method will conclude with me that the successful outcome of many surgically unfit cases is excuse enough for all the trouble we have, even though they are charity cases.

During the war the difficulty of getting instruments sharpened lead me to experiment with the sterilization in boiling oil and this was so satisfactory that I have continued this practice. Any neutral light hydrocarbon oil can be employed all of which have a higher boiling point than water and the one we are using boils at 260° F. and we put in an indicator such as is used in sterilization by steam to determine when a minimum satisfactory temperature is reached. I have been astonished to note that there seem to be grades of infection and that the eyes that have been operated on by these instruments seem less reddened by the operation and subsequent bandag-

ing than by instruments sterilized by alcohol or boiling water. The instruments are drained on gauze and passed through ether after being taken out of the oil and the edges seem almost unaffected by repeated use.

At present we are using after the operation a brown petroleum which is mixed with a light hydrocarbon oil so that it is just spreadable. This is put on the lids and in the corners of the eyes and over this a double butterfly cut of gauze also moistened with a lighter hydrocarbon, carefully smoothed out and adjusted to the face. Over this a double butterfly of cotton moistened to conform to the shape of the brows and cotton pads fastened with water adhesive plaster.

A little item we have found useful is to cut these strips long enough so that one quarter inch of each end can be turned upon its ends thus offering a finger hold in removing them when moistened. It has been so advantageous that we are doing it in all the cases now. In children, foreigners, or those who are apt to be unruly, we are putting on a figure of eight of light gauze and over this a Ring mask. On the Ring mask is a white cross made of adhesive plaster to indicate which eye has been operated upon. This is for the benefit of the floor supervisor or the night nurse who can tell by the slightest glance in the darkened room whether the patient is encroaching upon his operated eye in turning.

My choice is to operate in the afternoon thus insuring the patient a good first night. If the operation is done in the morning it is my experience that the patients do not have as good a first night. They sleep during the afternoon and are wide awake at night but if done at two or three o'clock in the afternoon, there is an hour or so to recover from the slight excitement and a little smarting and after a light supper they are content to settle down and the effect of the morphine has given them a long, easy dreamless sleep and they awake refreshed the next morning. This is my reason for operating in the afternoon.

If patients are unruly or complain of their back aching, we see no objection to their being half-raised in bed or reclined on one side or the other but it is important, however, not to start this turning unless it becomes absolutely necessary, for if a patient begins by being tired on first one side, then the other, they will want to be turned every half hour; while if they ignore

the first few calls of fatigue, they soon become accustomed to it and fall asleep and lie quietly the rest of the night. Children will do better usually with a double starch bandage as this allows them to be taken up and held but as a rule we only bandage one eye on a child as they are terrified when they awake and cannot see. In all these cases the lids should be splinted with one or two strips of water adhesive plaster put in such a way to prevent opening the upper lid.

It is very important that the bed be comfortable and I have three or four special beds and mattresses of a better grade than those ordinarily used for the comfort of my operative eye cases.

The first dressing is at the end of twenty-four hours, the bandage is removed but the eyes are not opened unless I note an odema of the upper lid in the inner angle of the eye. The eye having been thoroughly put under the influence of atropine at the time of operation, I do not worry about a possible iritis; I use atropine very sparingly. The first dressing is made at the end of twenty-four hours for the comfort of the patient and it is replaced without opening the lids at all.

We are very particular in using a flushing solution that is not too warm or too cold and we are using Sharp and Dohme salt tablets No. 2. One of these in eight ounces of water gives a bland unirritating solution which can be readily made and is much more satisfactory than the attempts of the nurse to make it from a brine which she uses for ordinary dilutions. I flush the eye thoroughly and it is very refreshing to have this warmed water pouring over the closed eye. This is done to both eyes and the bandage and complete dressing is replaced.

At the end of forty-eight hours the eyes are opened but nothing but the physiological salt solution is used unless there is some very special indication.

One should constantly keep in mind that comfort means rest and rest means prompt healing. The lashes should be straightened out at each dressing. A little round pledget of cotton dampened and pressed flat should be used to wipe the edges of the lids and the adjustment of the dressing on the eye should leave the patient refreshed. Mental confusion following operations can be very largely obviated by the following procedures: Arrange for someone in the family to call regularly and talk with them; even twice daily is not too often with bad

cases; then too I have found ward cases do not have this trouble as much as private-room cases, and I prefer rooms with two beds in them, having noted how well these cases pass the time away by chatting and this occupation is really the cure for the condition. The greatest complaint we have from these cases is the loneliness and this is done away splendidly by the two-bed ward.

To induce sleep for the second and third nights I use ten grains each of sodium bromide and chloral hydrate, and this can be repeated if necessary.

Watch especially for deaf patients and those who speak English indifferently.

The first symptom of lack of orientation has come on in the evening or night and the night supervisor should have special instructions to watch for and report the slightest vagueness of location. By having them sit up early in bed and the third day in a chair and the early use of unoperated eye if it has some vision, many of these cases go through without the slightest difficulty, even those who have a history of previous trouble.

When it is well marked give them all the vision possible and have a daughter stay most of the time. If the eye will permit it send them home; this is the great cure, but if this is not possible have a near relative sit and talk with them for hours and I have been very successful in winning them back. The cause of this is evidently the quiet, the lack of talking about familiar things, and the enforced blindness through bandaging. In dressing them encourage talk about their home and family, and the nurses should frequently drop in for a chat with them.

The second day, if there is no objection, the patient can sit up in bed and it is my custom to allow a little greater latitude each day.

The third day the eye is flushed freely with the warm physiological salt solution and the patient allowed to sit up in a chair. Most of my cases go through with no additional atropine except that instilled at the time of operation.

On the fourth day we give them the unoperated on eye. The lids will become sodden and there will be epithelial débris which it will take a little time to dislodge and clean. Usually the fourth day we use dry dressing, not even petroleum is used to moisten the gauze.

About the sixth or seventh day we allow one-half hour to an hour exposure of the eye to the air before the bandage is replaced and on the seventh day a still greater latitude is allowed and the eye is usually then white. The lashes are not matted down. There is no spastic entropion and the eye is at least three weeks farther in convalescence than is found by the old promiscuous use of atropine and sodden wet dressings day after day.

On the seventh or eighth day we make use of an eye shade. It protects the patient from the bright light, allows the eye to become gradually accustomed to use and does away with the bandage which is always a source of irritation. It also protects the eye from unauthorized handling and contact with surrounding objects.

I prefer not to have the patient leave the hospital until after two weeks. By that time the average patient has learned automatically to protect the eye and in three or four weeks the preliminary examination can be made for glasses.

METASTASIS OF CARCINOMA INTO AN ENDOTHELIOMA OF THE OPTIC SHEATH.[1]

By Dr. MARTIN COHEN and Dr. WARD J. MacNEAL.

(From the Department of Ophthalmology and Department of the Laboratories, New York Post-Graduate Medical School and Hospital.)

(*With eleven illustrations on Text-Plates II.–IX.*)

INTRODUCTION.

METASTATIC growth of one neoplasm within another is a well-established pathological phenomenon. Carcinomatous invasion of a dural endothelioma (arachnoid fibroblastoma) appears not to have been previously recorded and because of the relative infrequency of the latter tumor in the sheath of the optic nerve, the possible occurrence of such a combination would appear to be quite rare. This unique feature is associated with certain other clinical and pathological manifestations which give it a peculiar interest.

History of the Patient.—Mrs. J., æt. 45, housewife, was admitted on March 26, 1920, to the Harlem Hospital, service of Dr. Haubold, with his diagnosis of metastatic carcinoma of the brain. Her husband and six children are alive and healthy; no miscarriages. Patient stated that she had suffered for the previous three months from severe and constant pain all over her head, with nausea and recent failing vision in her only seeing eye, the right. The left eye had been practically blind for more than two and a half years,

[1] This paper was presented before the Ophthalmological Section, New York Academy of Medicine, October 18, 1920, and before the New York Pathological Society, December 8, 1920.

ILLUSTRATING DRS. MARTIN COHEN AND WARD J. MACNEAL'S ARTICLE "METASTASIS OF CARCINOMA INTO AN ENDOTHELIOMA OF THE OPTIC SHEATH."

FIG. 1.

Photograph of the opened cranium, showing the rounded tumor at the left optic foramen.

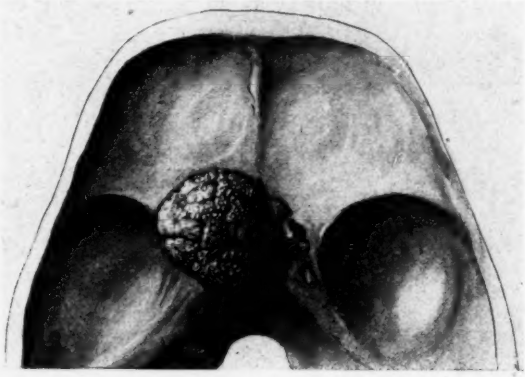

FIG. 2.

Drawing of the rounded tumor of the left optic sheath *in situ*.

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FIG. 3.

Section of metastatic tumor in the cerebral substance. (Photomicrograph.)

the exact duration being uncertain. Vision of the right eye had been good until very recently. Patient remembered that poor vision in left eye had existed at least for eighteen months before her left breast was removed. She complained of constant coughing, with blood-stained expectoration, constipation, poor sleep, and poor appetite. Menstruation was normal and had not ceased. Previous illnesses were of no significance except an operation for alveolar carcinoma of the left breast, performed by Dr. Russell Fowler at the Wyckoff Heights Hospital, Brooklyn, sixteen months before (*i.e.*, December, 1918).

Physical Examination.—The patient was a poorly nourished, mentally dull, partially disoriented woman. Left angle of mouth drooped; teeth were in poor condition. On left side of chest, extending into axilla, was an old scar of a Halstead operation. There was dullness over the base of the left lung, with distant bronchial breathing and voice sounds; occasional rales at the right base. Examination of heart and of abdomen were negative. The left upper extremity showed a marked atrophy and inability to functionate. The knee jerks were diminished on the left; normal on the right. Ankle clonus and Babinski's sign were not obtained. Palpable lymph glands were not enlarged. The urine was normal. Systolic blood pressure was 120; diastolic, 78. Temperature was 101; pulse 92; respiration 24; blood Wassermann negative. Examination of the head by Roentgen rays was unsatisfactory because of the incessant coughing.

The spinal fluid was under marked pressure and showed 20 cells per *cu. mm.*; Noguchi reaction was positive; Fehling test positive; smear for tubercle bacilli negative; Wassermann test negative.

The ophthalmological examination showed no exophthalmos, displacement of eyeball, or motor anomaly. Palpation for retroörbital growth was negative; tension was normal. Pupils were regular, central, and but moderately dilated. The direct pupillary reaction of the left eye was slight while in the right eye it was more pronounced but even here subnormal. The consensual reaction of both eyes was sluggish. Vision in the left eye was light perception only; in the right eye, motion of fingers at one meter. Light projection was normal in both eyes, but not prompt. No scotomata were elicited.

The fundus of the right eye showed a lesion confined to the disk and its immediate vicinity. This was reddish in color and elevated to 5 diopters; its margin completely obliterated by marked œdema, numerous spindle-shaped hemorrhages and whitish exudates. The veins were considerably en-

gorged and tortuous and the arteries contracted. In the left eye there was a distinct pallor of the temporal side of the disk; otherwise the appearance was normal. Fundus diagnosis was papillœdema in right eye, due to a metastatic carcinoma of the brain; retrobulbar neuritis of left eye, probably due to general carcinomatosis.

There are three interesting points in the clinical features, which require discussion:

(1) The practical loss of vision in the left eye, of long duration, associated with only moderate dilatation of the pupil, sluggish response to light, slight temporal pallor of the disk, and absence of vascular changes in the retina.

(2) The temporal pallor of the left disk.

(3) The unilateral papillœdema of the right disk.

These will be considered in the light of information subsequently obtained.

The patient's condition became more serious from day to day and after eight days in the hospital, she died.

Necropsy.—Examination was restricted to the cranium. Reflection of the scalp revealed a number of small whitish nodules over the right parietal bone, varying in size from 3 to 12*mm*. They were somewhat adherent to the scalp and some of them intimately adherent to the cranium. Upon removal of the skull cap both cerebral hemispheres showed flattening. Meninges appeared normal. Upon lifting the brain a whitish tumor was revealed at the base. The left optic nerve was elongated, running through the substance of the tumor and intimately adherent to it. The optic chiasm was depressed and pushed to the right. The right optic nerve was distorted and elongated. The tumor was attached to the left optic nerve between the chiasm and the optic foramen. Upon dissection the growth was intimately adherent and appeared to involve the sphenoid bone at the junction of the left wing and body. The pituitary body was compressed but not invaded by the growth. Cut surface of the tumor appeared white and homogeneous. Upon sectioning the brain, several separate tumor nodules were found in its substance, one in the right hemisphere, just anterior to the fissure of Rolando, near the cortical surface. This measures 12*mm* in diameter. A similar nodule in the temporal lobe measures 6*mm* in diameter and a third of similar size was found deep in the white substance of the posterior lobe of the same hemisphere.

Laboratory Study.—Several pieces of the cerebrum and a portion of the base of the skull, including both optic foramina and the intracanalicular portions of the optic nerves, were sent to the laboratory. Photographs taken during the course of the autopsy were also furnished.

ILLUSTRATING DRS. MARTIN COHEN AND WARD J. MACNEAL'S ARTICLE "METASTASIS OF CARCINOMA INTO AN ENDOTHELIOMA OF THE OPTIC SHEATH."

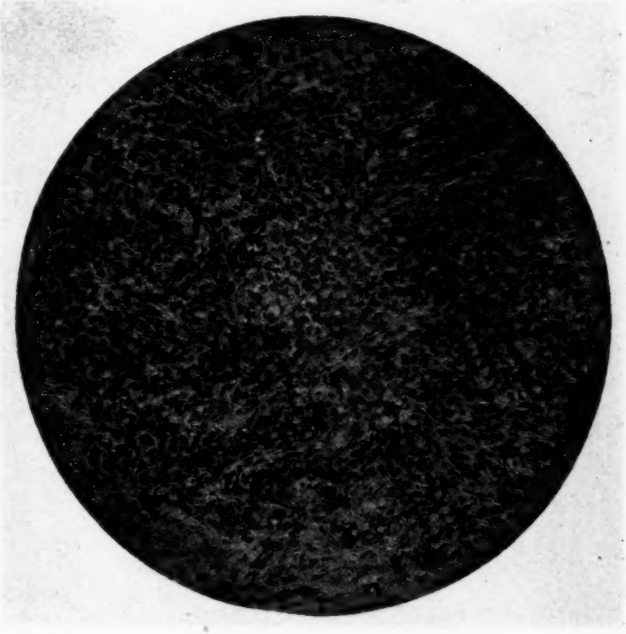

FIG. 4.

Section of the primary tumor of the breast, from the Pathological Collection of the Wyckoff Heights Hospital, Brooklyn, N. Y. (Photomicrograph.)

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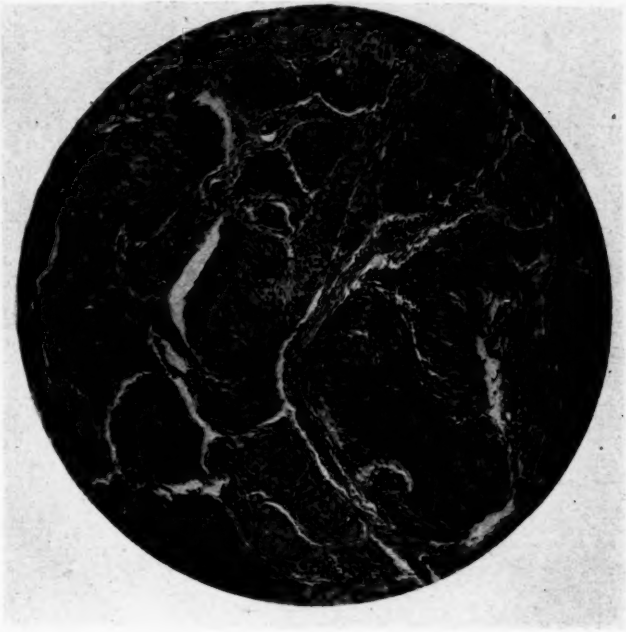

FIG. 5.

Section of the rounded tumor showing its general structure. Slightly to the left and above the center is a group of cells with large nuclei. This is a small nest of carcinoma. (Photomicrograph.)

One of these photographs shows a rounded tumor situated at the intracranial opening of the left optic foramen (Fig. 1). A drawing of the base of the skull (Fig. 2) shows more clearly the appearance of this tumor and its relation to the left optic nerve at its entrance into the cranial cavity. The pieces of cerebral tissue showed several separate round, infiltrated spots in the cerebral substance, widely scattered, evidently metastatic new growths.

The tissue was fixed in formalin. A small portion, approximately *2mm* in length, was cut from the intracranial end and from the orbital end of each optic nerve. These pieces were mordanted in Mueller's fluid, embedded in celloidin, and stained by the Weigert-Pal method and by iron hæmatoxylin and Van Gieson's stain. The bone of the skull was fractured and carefully separated from the intracanalicular portions of the optic nerves and from the rounded tumor. The tumor was nowhere adherent to the bone. The former was, however, intimately adherent to the dura and to the left optic nerve. The intracanalicular portions of the optic nerves were embedded in paraffin and sectioned longitudinally. The left nerve was considerably distorted in its passage through the tumor. The sections of the intracanalicular portions were stained with hæmatoxylin and eosin and also with iron hæmatoxylin and Van Gieson's stain. The large rounded tumor was divided and several pieces were sectioned in paraffin, stained with hæmatoxylin and eosin and with iron hæmatoxylin and Van Gieson's stain. Pieces of the brain containing the metastatic tumors were treated in the same way.

Microscopic Examination.—Sections of the cerebral metastases show infiltrating new growth consisting of rather large cells, somewhat irregular in form, with relatively large, vesicular nuclei and rich in mitotic division figures (Fig. 3). In places the tumor cells are closely packed in solid masses, especially around the numerous large blood vessels, but in other places they are arranged in narrow solid columns and even in tubules. Areas of necrosis are present. These metastatic tumors were regarded as metastases from the carcinoma of the breast, which had been removed about a year previously. Sections of the original breast tumor have been obtained from the Wyckoff Heights Hospital and, although somewhat faded, they show essentially the same type of tumor growth as is now seen in the cerebral metastases (Fig. 4). After consideration of other possibilities we still regard these cerebral tumors as carcinomata metastatic from the breast tumor.

Sections of the rounded tumor at the left optic foramen show a mixed character. In general it consists of irregular

whorls of densely packed elongated or spindle cells separated by somewhat looser connective tissue with moderate vascularity (Fig. 5). Small hyaline bodies with concentric markings and deposits of lime salts are present in very small numbers. At one place the lumen of a large vein contains a mass of the new growth projecting from the wall into the lumen (Fig. 6). These general features characterize the tumor as a dural endothelioma, perhaps the most common tumor found in the intervaginal space.

This new growth was readily separated from the neighboring structures with the exception of the left optic nerve and its sheath. This nerve is surrounded by the tumor at the inner termination of the optic foramen and considerably distorted. Approximately longitudinal sections of the nerve show the intracanalicular portion of the intervaginal space occupied by the endothelioma, which does not pierce the pial sheath but appears continuous with the inner layer of the dural sheath and the outer layer of the pial sheath of the nerve in this region (Fig. 7). The endothelioma has therefore taken origin from the layer of cells (endothelium?) lining the intervaginal space in the intracanalicular portion of the optic sheath; it has compressed the nerve in this region and has extended backward in the intervaginal space to the cranial cavity, where, relatively free from bony confinement, it has enlarged to the irregularly rounded mass shown in Figure 2.

Concerning the finer structure and classification of the cell type from which this tumor has been derived, the recent paper of Mallory should be taken into account. This authority would place all these tumors formerly designated as dural endotheliomata into a new class designated as arachnoid fibroblastoma. Mallory does not question the origin of the tumor from the layer of cells lining the intervaginal space, a layer which has long been called endothelium, but he does question this fundamental histological term and would regard this so-called endothelial layer as merely a differentiated connective tissue. The conception is supported by the demonstration of collagenous and elastic fibrils in the tumors.

It is of course evident that endothelium is closely related to connective tissue, and it may be a moot point just where the lymph channels are to be called clefts between connective tissue elements and where the lymph channels lined by endothelium may be said to begin. There can be no doubt, however, that the subarachnoid space, which is a potential cavity of wide extent, is actually lined by cells differentiated from the ordinary connective tissue cell. It would seem as reasonable to assume that endothelial cells, derived from

ILLUSTRATING DRS. MARTIN COHEN AND WARD J. MACNEAL'S ARTICLE "METASTASIS OF CARCINOMA INTO AN ENDOTHELIOMA OF THE OPTIC SHEATH."

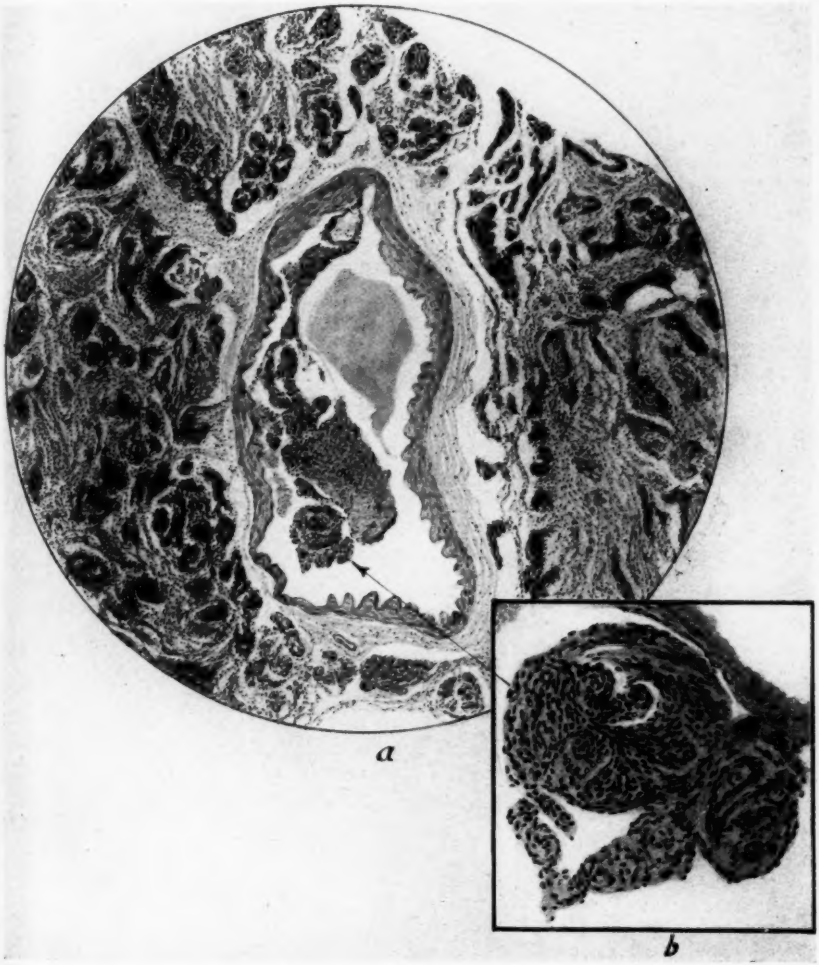

FIG. 6.

(a) Blood vessel containing a mass of new growth within its lumen. (b) A portion of the intravascular growth at higher magnification. (Drawing.)

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FIG. 7.

Section of the intracanalicular portion of the left optic nerve with new growth in the intervaginal space. The nerve is seen at the bottom of the picture. (Photomicrograph.)

mesenchyme, may also retain the property of producing connective tissue fibrils under the conditions of tumor formation. However, because these tumors derived from the lining of the subarachnoid space and of the intervaginal space constitute a fairly definite group, it may be well to use a distinct name for them. Whether the name arachnoid fibroblastoma (fibroma) is really better than the name endothelioma may be left undecided for the present. According to Byers this tumor is the most common intradural tumor of the optic nerve.

An interesting feature of this case is the presence of groups of cells of a quite different type within the endothelioma. Such a small group is shown in Figure 5, and in Figure 8 a large part of the picture is occupied by these cells. It is only in the inferior and mesial portion of the tumor that these cell groups are found. They correspond in all respects to the type of cell in the cerebral metastases and in the original mammary tumor (Fig. 4) and many of their cells are in process of mitosis (Fig. 9). It is therefore evident that we have here a metastatic carcinoma of more recent development invading the basal portion of a dural endothelioma of longer standing. In most places one has little or no hesitation in deciding to which tumor any group of cells may belong, but there are some areas in which a possible transition is suggested. We are, however, inclined to discredit the evidence of such transition and cling to the earlier explanation.

Sections of the pituitary body show very small nodules of metastatic carcinoma present in this structure also; but nothing suggesting an extension of the endothelioma into this organ.

Pathological alterations have not been demonstrated in the sections of the right optic nerve. The left optic nerve, on the other hand, was markedly distorted and compressed near its entrance into the cranial cavity and the intervaginal space filled up with new growth in the inner half of the intracanalicular portion. Next to the nerve, this new growth is endothelioma with only small scattered nests of carcinoma and it does not pierce the pial sheath. Farther away, however, there are abundant nests of carcinoma and these invade the dura in the vicinity. The cross section at the intracranial end, stained by the Weigert-Pal method, shows extensive degeneration of the nerve (Fig. 10). This has probably been brought about by the pressure upon the nerve within the optic foramen. The cross section at the orbital end (Fig. 11) shows the myelin fairly well preserved for the most part but there is a somewhat indefinitely outlined, crescentic light patch of degeneration in the temporal half of the nerve,

which evidently corresponds to the situation of the more delicate papillomacular bundle of fibers.

The anatomical points of interest which require discussion may be enumerated as follows: (1) Multiple metastatic carcinoma in the cerebral substance and in the pituitary body; (2) large dural endothelioma (arachnoid fibroblastoma) arising in the intervaginal space in the intracanalicular portion of the left optic sheath, compressing and distorting the nerve, and extending backward and expanding into a large rounded mass in the intracranial subarachnoid space; its pedicle and inferior portion being infiltrated also by metastatic carcinoma; (3) extensive degeneration of the intracranial portion of the left optic nerve associated with rather limited degeneration confined to the papillomacular region of the posterior orbital segment of the same nerve.

Discussion.—The almost complete loss of vision in the left eye, which began several years before, may be explained as due to pressure upon the intracanalicular portion of the optic nerve, exerted by the slow-growing dural endothelioma. This same pressure accounts for the degeneration of centripetal fibers in the intracranial portion of the left optic nerve and also offers an explanation for the absence of œdema of the nerve head in the left eye, for it has blocked the transmission to the orbital portion of the left intervaginal space of the augmented intracranial pressure during the last weeks of the patient's life. The retinal circulation in this eye remained undisturbed as the tumor was located entirely posterior to the entrance of the central artery and vein.

The temporal pallor of the left optic disk, seen during life, is to be considered in conjunction with the rather distinctly limited degeneration of the papillomacular bundle. Evidently there has occurred here a relative selection of these particular neurones for destruction, such as is observed in certain general intoxications. Three possible explanations for this degeneration may be offered: (1) The pressure upon the nerve may have initiated a centrifugal degeneration of these fibers proceeding toward their ganglion cells in the retina from the point of pressure, the other fibers of the optic nerve having escaped because of their less delicate and less highly specialized character. (2) The papillomacular bundle may have degenerated because of a general intoxication to which these structures

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FIG. 9.

A portion of the field slightly to the left and below the center of Fig. 8, showing the border between the two neoplasms. Note the mitotic figures in the carcinoma. (Drawing.)

FIG. 8.

Section of the lower part of the rounded tumor showing carcinoma to the left and endothelioma to the right. (Photomicrograph.)

ILLUSTRATING DRS. MARTIN COHEN AND WARD J. MACNEAL'S ARTICLE "METASTASIS OF CARCINOMA INTO AN ENDOTHELIOMA OF THE OPTIC SHEATH."

FIG. 10.

Section of the distorted intracranial end of the left optic nerve, stained by Weigert-Pal method. (Photomicrograph.)

FIG. 11.

Section of the posterior end of the orbital portion of the left optic nerve, stained by Weigert-Pal method. A degenerated area is present in the superior temporal quadrant. (Photomicrograph.)

have been more susceptible than the remaining optic fibers. (3) This papillomacular degeneration may have resulted from a relatively localized light choroiditis or degeneration of the retinal ganglion cells of the macular area induced by excessive stimulation, because the visual structures of the left eye have been denied their normal reflex protection against excessive stimulation through the interruption of the centripetal limb of the reflex arc. Such injurious stimulation might be expected to destroy first the most highly specialized visual elements. Of these three suggested explanations none can be said to be securely established by the available evidence and logical objections may be raised to each in turn.

The unilateral papillœdema in the right eye is obviously to be regarded as the ordinary phenomenon seen in brain tumor, due to heightened intracranial pressure forcing an excessive quantity of fluid to seek its exit along the intervaginal space of the optic sheath, dilating this space back of the sclera and exerting pressure upon the optic nerve and the retinal vessels. In the left eye this phenomenon was lacking because the endothelioma blocked the intervaginal space from the excessive intracranial pressure.

The dural endothelioma (arachnoid fibroblastoma) is to be regarded as a growth of several months, possibly several years duration. It shows the typical structure of this variety of tumor, whorl formation, hyaline and partly calcified concentrically marked spherical bodies, and in one place a large cellular bud projecting into a vein. This last feature indicates the close relation to the normal arachnoidal villi and is essentially similar to that shown in Figure 11 of Mallory's paper. The rapidly proliferating cell nests within this tumor are considered to be of the same nature as the similar cell nests found in the pituitary body and in the multiple tumor nodules in the cerebrum, and all these are regarded as metastases from the carcinoma of the left breast, removed sixteen months previously.

Summary.—In this case there has been a dural endothelioma of long duration extending from the sheath of the left optic nerve into the cranial cavity. Subsequently, multiple metastases from a carcinoma of the breast have developed within this earlier tumor, in the pituitary body, and in various parts of the substance of the brain. The unusual ophthalmological

manifestations are explained in a large measure by the simultaneous occurrence of these two neoplasms. There is presented here an instance, unique so far as we are aware, of the invasion of a dural endothelioma by metastatic carcinoma.

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OCULAR MANIFESTATIONS OF DISEASE OF THE PARA-NASAL SINUSES.[1]

By Dr. JAMES BORDLEY, Jr., Baltimore, Md.

(With four illustrations in the text.)

IN view of the voluminous literature which is classified under my title, I feel that I must offer some reason for again calling attention to the subject. While I will probably say nothing that has not been said many times before, I find my justification for this communication in the interest which is frequently excited by a recitation of personal experiences. In truth what I write has in the main come to me through clinical and laboratory studies and I only offer it as confirmatory evidence of what has been pointed out before.

The presence of diseases of the para-nasal sinuses is sometimes extremely easy to determine, at others it presents problems which are only solved by careful, thoughtful, and I can almost say prayerful study. To pass a final opinion as the result of one negative investigation is only inviting disaster for the patient and mortification for the physician. Indeed, I have come to look upon the diagnosis of sinus disease in many instances as an achievement. To depend solely upon intranasal inspection is folly—more frequently one would be misled than helped. There are but three reliable indications of sinus disease to be elicited by such an investigation: pus, polypi, and necrotic bone and they are more frequently visually absent than present.

In doubtful cases, we can call to our aid transillumination—which is helpful only in the anterior cells—or suction—which

[1] Read before the College of Physicians, Philadelphia, Pa., November 18, 1920.

will make manifest pus when the ostium of the sinus lies below the level of the pus. It is, however, upon the radiograph that we must largely depend. While this last offers exceptional advantages a single negative finding should not be considered as definite evidence of the non-existence of sinus disease. Its value is dependent not alone upon the clarity of the picture but upon the experience of the one who translates that picture. Only the other day, I saw a child with choked disks on whom had been performed a radical antrum operation in consequence of the radiographer mistaking an occipital ridge for pus in the antrum. The child really had choked disks the result of a cerebellar tumor.

To read a picture, it is essential to know the plane in which it was taken and the shadows which necessarily result from bony obstructions. It is also necessary to have a clear mental picture of the anatomical variations in size and position of the sinuses. Of course radiographs are valuable not only in detecting pus but in determining bony deficiencies and disease of the mucus membrane. One distinguished radiographer told me that he would never give a final opinion on any sinus without first viewing it from six different positions. These difficulties which I have outlined are only too real—and are sufficient proof of the statement which I recorded above—that a negative finding of any single method of examination is not proof of the absence of sinus disease.

I hope it is clear that it is essential to a correct diagnosis that every available bit of evidence be brought to light and as the ocular manifesations of sinus disease are many and fairly common, a close association of rhinologist and ophthalmologist has sought the advice of the rhinologist in solving his ophthalmological problems but I fear the rhinologist has not always availed himself of the opportunity to utilize the services of the ophthalmologist. I earnestly plead for the sake of a clearer understanding that this natural affinity be fostered. For the general surgeon and the internist who are seeking light on obscure diseases dependent upon infectious foci, a union of forces, ophthalmological and rhinological, has frequently resulted in the discovery of important evidence.

As I propose to speak only of optic nerve disturbances, it is not necessary to analyze the extensive literature of the ocular

manifestations of sinus disease which has accumulated in the last few years. There are certain symptoms, however, which occur with sufficient frequency as to render them of diagnostic value. The most important of these are, orbital neuralgia; fugitive œdema of the eyelids; congestion of the conjunctiva with the familiar "wet eye"; recurring attacks of episcleritis; and paralysis of one or more of the ocular muscles. None of these conditions are constant, none are peculiar to sinus disease, nevertheless their presence must be considered as at least suggestive.

DeSchweinitz says: "It is well known that sinusitis may be associated with ophthalmoscopic lesions, such as optic neuritis, retrobulbar neuritis, and thrombosis of the retinal vessels. It may manifest itself as an ordinary œdema of the nerve head or as an inflammatory optic neuritis. In a certain number the manifestation is that of a retrobulbar neuritis with its well known symptoms of obscuration of vision progressing to complete or almost complete blindness, with at first negative ophthalmoscopic findings." These ophthalmoscopic pictures are not of uncommon occurrence, and are when discovered of great diagnostic importance.

My experience leads me to believe that the most usual ophthalmoscopic picture is that of dimness or haziness of the margins of the disk. What this means in terms of pathology I do not pretend to know but that it is by no means pathognomonic of sinusitis is quite certain. Considered by itself, it is valueless, but taken in conjunction with other evidence, it is suggestive.

We find the picture of inflammatory neuritis, retrobulbar neuritis, and choked disk. Like haziness of the margins of the disk, these symptoms taken alone are only suggestive. In our series inflammatory neuritis was more frequently met with in early adult life and in association with moderately acute nasal symptoms; retrobulbar neuritis with its typical ophthalmoscopic picture occurred in chronic types of sinusitis; and I have come to regard choked disk as an indication of a possibly serious extension of the sinus disease. I have seen but four patients with choked disk, and in three post-mortems which followed very definite evidence of the disease to the meninges was present. I have no doubt a sort of benign choked disk can

result from an increase in intracranial pressure brought about by non-purulent reactions in the cavernous sinus or the meninges just as transitory choking of the disk develops as the result of inflammatory disturbances of the mastoid and middle ear. As a rule, such nerve heads recover leaving behind little or no evidence of damage.

The ophthalmoscope is helpful in spite of its marked limitations but of even greater service is a study of the fields of vision. As the nerve is exposed to diseases of the sinuses from the tract to the eyeball, changes in the visual fields may assume practically any known form, some, however, as diagnostic evidence are of much greater value than others and in the foremost rank I would place enlargement of the blind spot of Mariotte.

As a result of clinical and experimental evidence, I am forced to disagree with the suggestion that enlargement of the blind spot is a constant symptom of disease of the para-nasal sinuses. In 102 patients with sinusitis enlargement of the blind spot was discovered but thirty-one times. It was found more often in disease of the posterior than the anterior sinuses—in the proportion of five to one, and it was never our fortune to find it associated with infection of the maxillary antrum. Theories concerned with its production are too numerous to consider. We can, however, briefly sum them up by saying that most authors agree that the primary injury is to that portion of the optic nerve—the canalicular—which lies in the optic canal. Swelling of the soft tissues in this rigid canal from any cause must result in a certain inhibition of the functions of the optic nerve. If the pressure is not intense, or is short lived, the result will be an enlarged blind spot as the most peripheral fibers are the peripapillary fibers of the retina; if the pressure is continued indefinitely the whole nerve will cease to function. We proved experimentally that enlargement of the blind spot will sometimes follow excessive tension within the sphenoid sinus. In eight patients with sphenoiditis but with normal blind spots tampons were placed with varying degrees of pressure in the sphenoid. The fields of these patients were systematically watched and in two definite evidence of disturbance in the nerve developed. In one of these patients (in whom the mucous lining of the sphenoid had been virtually destroyed by disease) within an hour had a hazy color zone surrounding the

blind spot, this was followed within five hours by the formation of a positive enlargement of the blind spot surrounded by a relative color scotoma. Is it possible that our failure to alter the blind spot in six cases was dependent alone upon the thickness of the sinus wall?

To account for the alteration in the blind spot associated with disease of the anterior sinuses is not altogether an easy task. It seems probable, however, that the periosteum of the orbit becomes involved in the sinus disease and as the duro-periostial lining of the optic canal is virtually only a continuation, becomes swollen also, this causing pressure on the nerve. Schaeffer has told us of a frontal sinus which lies in close proximity to the optic nerve, and has pointed out as another possible factor certain vascular connections, these deserve the most serious clinical consideration.

While of less frequent occurrence than enlargement of the blind spot, other para-central and central scotomas are more interesting and from a visual standpoint more important. The intensity of central change varies from a mere disturbance in red and green perception to a positive scotoma for colors and white extending beyond the normal blind spot. While some authors have attempted to differentiate this scotoma from similar changes due to other causes I have found but two significant facts: in sinus disease the alteration is usually unilateral and more rapid and definite in its formation. There are, however, many exceptions to this rule.

We are still in doubt as to the direct causative factor in central blindness. Birch-Hirschfeld looks upon it as a result of toxæmia resulting from venous stasis within the optic canal; Hajek described it as a sign of perineuritis from pressure; and Gradle attributes it to disease extension through soft tissues and vessels from the infected sinuses. In the eleven cases that I have observed, it appeared only as a symptom of chronic sinusitis; in but four of these patients was it associated with enlargement of the blind spot.

Disturbances in color perception and peripheral contractions are so influenced by pain, fatigue, and alterations in illumination as to make them of little or no diagnostic value.

Many patients with sinus disease seek our advice for disturbances in visual acuity. It is a well recognized fact that in

many of them there is a central or para-central scotoma; others have large extracentral scotomata which bother vision, and still others present no objective signs of disease. There is one other cause of visual disturbance which finds scant mention, failure of accommodative power. We found it proportionately more often than enlargement of the blind spot. Without a marked error of refraction exists, the disturbance in distant vision is not troublesome, but in close work it frequently is productive of much discomfort. I mention this symptom because I believe the resulting visual disturbance is usually laid to the door of the optic nerve. I saw a patient only a day or so ago whose sole symptoms were persistent basilar headaches and—as she expressed it—"a cross-eyed feeling." She required a presbyopic correction of 1 D. in her left eye and 4 D. for her right. She proved to have a right sphenoidal sinusitis. We were also able experimentally to prove the accuracy of this observation. By injecting irritating substances within the spenoidal sinus a relaxation of accommodation was temporarily brought about and the near point carried further from the eye. In a patient with syphilitic invasion of the nose and para-nasal sinuses and extensive destruction of the mucous lining, we were unable to induce a change in accommodation. We assume this to be a reflex disturbance originating in the muco-periosteal lining of the sinuses.

To summarize, as a result of sinus disease we may have disturbance in the optic nerve varying from slightly blurred vision associated with no objective sign to profound atrophy. We will not wonder at this if we will but superficially examine the published anatomical studies of Onodi, Loeb, and Schaeffer. For nearly half and sometimes more of its length, the optic nerve lies in contact with the thin walls of either the posterior ethmoid or sphenoid sinuses and frequently with both. The danger to the nerve is enhanced by the fact that not only are its intracanalicular and intraorbital portions exposed to attack, but likewise the chiasm which lies on the superior wall of the sphenoid. Damage to the nerve apparently depends more upon the thickness of the sinus walls and its proximity to the cavity of the diseased sinus than upon the intensity or nature of the sinus disease.

Before showing some slides illustrative of clinical disease,

may I be permitted to express the hope in dealing with such eye affections conservatism should be our watchword. And by conservatism I do not mean fear to follow a bold course when necessary. I would rather define it as action based upon striking evidence. If we are to judge by published statements, inoffensive sinuses are frequently obliterated before a careful diagnostic routine has eliminated other possible causes, in the hope such action will cure some obscure ocular disease. Unfortunately, we know no ocular manifestation peculiar to sinusitis, nor do the coincident presence of the two justify the assumption that the one is dependent upon the other. Optic nerve disease is not only a serious menace to sight, but it is only too frequently an early manifestation of serious constitutional disease. It behooves us therefore before attempting intranasal operative treatment to make sure that we have neglected no essential detail in diagnosis. Sinus operations are not free from danger either to eye or life—it is, therefore, incumbent upon us before undertaking such procedures to fortify ourselves in advance by submitting our evidence and the patient for the careful inspection of a competent internist or neurologist.

Case I.—The first case which I wish to present is that of a man of 36, who for about two years had been subject to

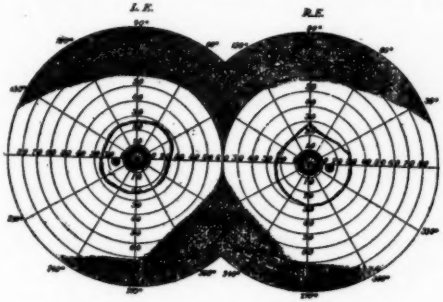


Illustration No. 1, Case I. Before operation.

severe basilar headaches. He consulted a confrère of mine for some visual disturbance in the fall of 1916. My connection with the case was that of consultant and it is by permission that I recite in brief the circumstances.

Upon examination the patient was found to have bilateral para-central ring scotoma, marked peripheral contraction, central vision in each eye of $\frac{20}{100}$. The ophthalmoscopic appearances were quite normal. The right sphenoid occupied a large portion of the body of the sphenoid bone, the left sphenoid was rudimentary and both were the seat of disease. The superior posterior wall of the right sinus was found necrotic and fairly well covered with granulation tissue.

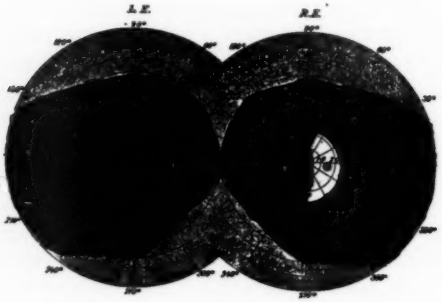


Illustration No. 2, Case I. After operation.

The patient was operated upon, the anterior wall of the sinus was broken down, and the granulation tissue was very carefully removed. Immediately following the operation the patient complained of inability to see across the room. No examination was made at the time. The next morning it was discovered that the patient was blind except for a small visual area in the right eye and the nerve heads were distinctly cloudy. Microscopic examination of the scraping from the sinus proved the mass to contain shreds of nerve fibers, obviously parts of the chiasm. The patient developed meningitis and some days later died. Post-mortem examination was refused. This case illustrates very graphically one of the serious consequences which may fall to the lot of the most skillful and experienced surgeon in operative procedures on the sphenoid sinus.

CASE II.—In January, 1917, I was requested to examine the sinuses of a patient with spreading infectious arthritis whose right eye was said to have gradually become blind.

Upon inspection the right side of the nose was found to be the seat of extensive suppurative disease involving the ethmoidal labyrinth and the sphenoidal sinus; the left middle

turbinate was markedly swollen and pus was discovered in the corresponding sphenoidal sinus.

The margins of the right optic disk were obscured, the retinal veins were rather full and slightly tortuous; in the

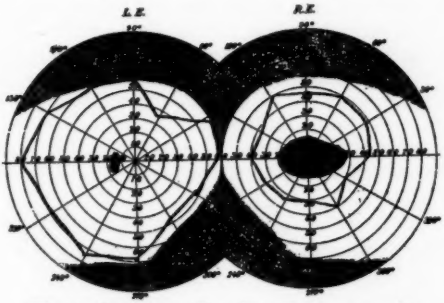


Illustration No. 3, Case II. Before operation.

field of vision there was a large absolute central scotoma involving the blind spot associated with marked peripheral contraction. The left fundus was normal; vision $\frac{10}{15}$; an enlargement of the blind spot with slight irregular peripheral

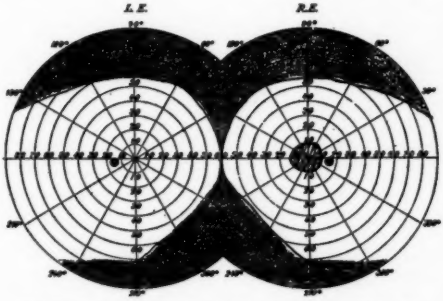


Illustration No. 4, Case II. Five months after operation.

contraction. The right ethmoidal labyrinth and sphenoidal sinus were subjected to operation and within twenty-four hours a marked convergent squint developed.

As the patient's physical condition—the result of his invading arthritis—demanded action, the left sphenoidal sinus was operated upon the following week. In spite of the

fact that no attempt to do more than enlarge the normal outlet of the sinus so as to insure drainage, a convergent squint developed in the eye on this, the left side. I have seen paralysis of the ocular muscle before as a sequel of sinus disease but never from operation. Since then I have seen one other case—in consultation—the result of catheterization of the sphenoidal sinus.

These cases evidently belong to that group described by Professor Schaeffer in which the abducens lies more or less exposed in the wall of the sphenoidal sinus. Fortunately, the double convergent squint made a rapid recovery and the fields of vision, taken some weeks later, were free from scotomata except for a small relative central scotoma on the right side.

TOTAL KERATOPLASTY.[1]

By Dr. J. W. BURKE, Washington, D. C.

THE question of successful transplantation of the cornea has been for many years the dream of ophthalmic surgeons. The first attempt was made by Riesinger in 1818, who attempted to transplant from one animal to another. Earlier than this Pollier de Quengsy (1787) had attempted to insert a piece of glass in the cornea. He was followed by Nussbaum and much later by Von Hippel, but these cases were uniformly unsuccessful, though Salzer was able to hold a small piece of celluloid in the cornea by small hooks for nearly three years.

About 1835 Bigger performed a number of transplants on animals, but his results were unsuccessful, owing to the difficulty experienced in keeping them still and the resultant infections.

From 1839 to 1843 Koenigshoefer, Muehlbauer, and Hauenstein experimented on animals, performing partial keratoplasties, in which Descemet's membrane was not removed. The results were fair as regards transparency.

In 1872 Power advocated the use of a cork borer in removing the cornea, and simultaneously Von Hippel's work gave the subject a tremendous impetus. Having given up the older methods of operation he led a number of contemporary investigators in the use of the trephine. This was considered a great advance, Von Hippel devising later a very ingenious trephine for the removal of the graft, and the preparation of the patient, and it stimulated such men as Fuch, Zirm, and Magetot. Each of these has done valuable experimental work,

[1] Candidate's Thesis accepted by American Ophthalmological Society, 1920.

Magetot especially. He emphasizes the use of a large button of cornea, 5 to 6*mm* in diameter, using a modified Elliott's trephine for its removal. In a careful study of the subject he is convinced that corneal grafts can be kept for some days in Ringer Lock solution, having reported a case successfully so kept for eight days, with fair operative results.

Opposed to trephining, Morax, Stauch, and Wolf, and much later, Loehlein believed that it was necessary to establish the nutrition of the graft as quickly as possible, and each of these experimented with flaps including a portion of the conjunctiva, Loehlein devising a very ingenious operation, described in the ARCHIVES OF OPHTHALMOLOGY, 1912.

So far the subject has been approached from two standpoints (having first eliminated the question of foreign body inserts), the slow restoration of nutrition to the flap, and the rapid restoration of the same. Those who advocated the use of the trephine felt that the rapid restoration of nutrition was attended by greater vascularization and growth of fibroblasts in the graft, while adherents to the graft with conjunctival attachment felt it essential to restore the nutrition with the least possible delay.

In 1919 Bonnifon published the conclusion of his researches on the regeneration and transplantation of corneal tissue which present still another angle to the subject, his conclusions being as follows: The apparent integrity of the graft and especially the conservation of transparency are not a criterion of survival. The division of grafts into autoplastic, homoplastic, or heteroplastic has no absolute value, certain heteroplasties evolve clinically and histologically as the best autoplasties. The grafts which are assimilable act as a frame for tissue replacement, eventually all of the graft being replaced except the epithelium.

My own view of corneal transplants was gradually evolved from the fact that I believe primarily that it is necessary to establish the nutrition to the graft as quickly as possible, with as little disturbance as an operation of such magnitude permits. I eliminated heterogeneous grafts as hopeless from previous experiments, and autogenous as impracticable. (I have never seen a case where I thought one was justified in using normal cornea of an already damaged eye to attempt a

graft, though I do not deny this may in extremely rare cases occur.)

I was stimulated to graft the entire cornea from work which Gehrung began in 1909, his idea being to dissect the conjunctiva from the cornea at the limbus, back a short distance, denude the cornea of its epithelium for *2mm* from its margin, put a purse string suture around the conjunctiva, draw it up over the denuded cornea and allow it to heal and reëstablish its circulation. Remove the center of the cornea from the animal to be grafted and after making a large circular flap in the donor remove the cornea with its new conjunctival attachment, making the transplant of the same diameter as the corneal opening of the host. This work was done on rabbits, but while under my observation no transplants were made, owing to all the rabbits becoming infected in their preparation.

The only attempt at total transplantation so far reported was one by Shimanowski, who made a corneo-ciliarplasty on a young male adult, reporting vision of fingers at the end of seven months, but one year later phthisi bulbi, following an attempted iridectomy.

The operation that I have devised after perfecting the technique on fresh cadavers and rabbits is as follows:

DESCRIPTION OF THE OPERATION.

After the usual aseptic preparation of the eye, under cocaine and adrenalin anæsthesia similar to that used in cataract operations, the conjunctiva is incised *3mm* from the limbus, making a complete circumference of the cornea. This is then dissected towards the cornea, keeping close to the sclera, the dissection being continued well on to the cornea until the semitransparent cornea can be seen, being careful not to buttonhole. In cases where the patient is unruly I would suggest the placing of four sutures through the insertion of each rectus. Fold the conjunctiva well back on the cornea towards its center. With a cataract knife perforate the cornea at the limbus, making an opening large enough to insert the blade of a curved Stevens scissors. With short snips remove the cornea completely with its conjunctival fringe. Difficulty in avoiding the iris may be found, but by using Stevens scissors whose points have not

been too sharply ground I have found this comparatively easy to do. The transplant should have been prepared in the same way just prior to the removal of the cornea from the host, and kept in warm saline until ready for use. With the unimpaired iris, *i.e.*, the sphincter, intact, both in animals and human beings I found no tendency for the lens to escape, the iris holding it well in place. At this stage care is observed in keeping traction on the sutures, as well as to prevent the orbicularis from exercising pressure on the globe. Assuming that all corneas have practically the same diameter, this graft is now fitted in place, the conjunctiva of the graft sutured above and below, right and left to the margin of the conjunctiva of the globe. As many interrupted sutures as necessary are now placed between these, twenty to twenty-four usually being sufficient. These should be of fine silk, not tied too tightly, the ends cut short in order not to overlap the cornea. If the conjunctiva is very elastic I prefer to make the conjunctival flap removed from the patient a trifle longer than the one attached, in order to secure a slight pull, thereby keeping the edges of the graft in close approximation to the sclera of the host, as I consider the quick restoration of the anterior chamber of prime importance. This I have seen accomplished at the time of the first dressing, twenty-four hours afterwards. The eye is irrigated with boric acid, a 1% solution of pilocarpine instilled to keep the iris away from the wound, bichloride of mercury salve (1–5000) is applied, particularly over the puncta, a light but snug bandage is put on both eyes and a Ring mask. The eye is dressed in thirty-six or forty-eight hours, atropia being used as soon as the anterior chamber is restored. Both eyes should be kept bandaged for at least two weeks, and the stitches removed not earlier than eighteen or twenty days, though many will have been found to have cut out by that time. Liquid diet, absolute confinement to bed for the first two weeks, and no purgative for at least five or six days I consider essential.

CASE I.—C. T., age 36. In January, 1912, was burned by liquid ammonia from an explosion in ice plant. Had been under care of various ophthalmologists until seen by me, July, 1913. Examination at that time showed well nourished man of laboring class, poor intelligence. Physical examination revealed nothing. Ocular examination showed surface

of lids normal, margins normal, scars on palpebral conjunctiva. Cul-de-sacs were not much shallowed. Ocular conjunctiva scarred, slightly thrown into folds. Scar tissue extending on to the cornea. No symblepharon. Cornea totally opaque both eyes, with slight thinning in scar above left eye. Vision in each eye light perception only. Tension to fingers normal. After keeping patient in hospital for about seven weeks a case of injury was admitted to hospital in which a piece of steel had been driven through the lower lid and through the equator of the eye. Through the kindness of one of my colleagues I was given the cornea from this case, several days after the injury. At this time there showed large quantities of exudate in the vitreous, but several cultures taken from the vitreous on three different media two days before operation failed to show any growth. The graft was removed under ether just before the eye was enucleated, the patient having been prepared in the adjoining operating room. During the time of removing the cornea from the patient in preparation for the graft, the graft was kept in warm saline for about one hour. The steps of the operation were essentially as have described, the patient suffering a good deal under 4% cocaine and holocaine anæsthesia. No vitreous was lost, the iris remaining well contracted during the operation. There was very little bleeding.

First day (at end of twenty-four hours) first dressing was done. No secretion, no pain, cornea clear, epithelium glistening, anterior chamber fully restored, iris contracted, eye quiet. Atropine 1% was instilled, eye rebandaged with bichloride salve dressing.

Second day. Conditions same, iris well expanded. Atropine and dressings same. This remained unchanged until eighth day, when corneal epithelium became very faintly hazy, but cornea retained its perfect transparency, and on fourteenth day patient remarked he could see perspiration on my face. By this time one half of the stitches had cut out. Eye remained quiet, iris well dilated, no iritis, no synechia, sensation to cornea not restored, faint secretion, but no more than one usually finds in an eye bandaged for the same length of time.

Sixteenth day. Slight low-grade infection at stitch near lower margin of cornea, with deep infiltration of cornea about three millimeters towards center, epithelium still intact, though very faintly œdematous. All stitches were removed as union had firmly taken place. Argyrol 25% instilled and patient redressed. From this time on the cornea became rapidly opaque. The epithelium never sloughed off, though it became very soft. The cornea became very

soft and somewhat irregular. At the end of six weeks, after treatment of hot applications and dionin the patient was allowed to go home and was not seen for fifteen months, at which time he reported for operation on the other eye, as the first eye had seemingly been a complete failure. Examination showed the cornea totally opaque, slight sensation, slight vascularization from conjunctival vessels.

Tension 20. Vision hand movements.

Was not seen again until February, 1920. Giving the subsequent history. From year to year the vision of the left eye improved slowly until April, 1919. He was able to get about the neighborhood by himself, seeing and recognizing objects about him, living in Fredericksburg, Virginia. Was able to see arc lights four or five squares off at night. Suddenly the eye became very painful. After two weeks of great suffering he consulted a local ophthalmologist, who advised removal. Returned to Washington, I being away, was treated at Episcopal Eye, Ear, and Throat Hospital for ruptured globe. Remained there five days and went home. At present the eye is phthisical. I feel without knowing that secondary glaucoma developed, which very probably could have been prevented if he had been under observation. However, at the end of six years he had partially useful vision after a total transplantation of the cornea.

Case II.—In January, 1915, operation was done on the right eye. The corneal graft in this instance was obtained from a case of absolute glaucoma whose eye was to be enucleated. The cornea was slightly œdematous. The steps of the operation were similar to those described up to the removal of the cornea from the host. As this was being completed it was found that an iridectomy had been done. Just as the cornea was removed, the lens, no longer being retained by the sphincter, was extruded with about one third of the vitreous. With very little hope of success, the graft was placed in position and sutured. The eye was not dressed for seventy-two hours, at the end of which time the cornea was found to be hazy, the eye flaccid, but very little reaction. The corneal haze steadily increased, though the graft held well in position until at the end of three weeks all stitches were removed.

At the end of the fourth week the patient was allowed to go home, the eye still very soft but quiet. He was not seen again until February, 1920, when he presented the following appearance: The globe was full, tension 15, the cornea fibrous, many conjunctival vessels passing through its substance, a few calcareous deposits, complete sensation present

over the whole area. No iris could be seen, no line of suture between graft and sclera visible. Vision light perception.

CONCLUSIONS.

1. The ingrowth of fibroblasts and the vascularization of the cornea is less, owing to the size of the graft. The center has a greater chance to remain clear.

2. In the former operations devised, in which the whole thickness of the cornea is not removed, there is much difference of thickness of the cornea and graft, and a great amount of irregular astigmatism, which is obviated in great measure in this type of operation.

3. The life of the graft is more certainly assured, both from the larger conjunctival flap, in close contact with the vascular conjunctiva of the host, and in addition the greater nutritional advantages that the cornea enjoys at its margin.

4. There is no danger of the graft slipping from its position as in all trephine cases, nor is there any maceration of the graft from stitches.

5. The apparent interference with the drainage system of the eye is not absolute, though this may present one great drawback to the operation. In one case the tension remained normal or nearly so for six years before secondary glaucoma developed, and in the second case tension was slightly subnormal at the end of six years.

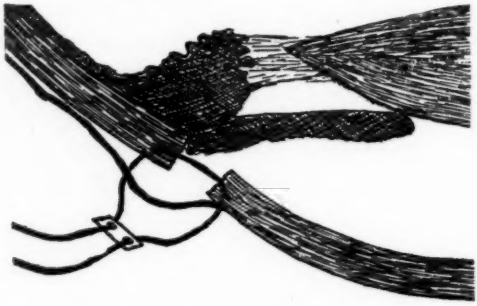
6. I believe that total transplantation of the cornea is a perfectly practicable procedure, in spite of the seeming impossibility of its accomplishment, and that its further development will give us our best chances of good results.

THE CLOSURE OF TRAUMATIC SUBCONJUNCTIVAL CORNEOSCLERAL FISTULA.[1]

By Dr. HARRY S. GRADLE, Chicago, Ill.

(With one illustration in the text.)

A SUBCONJUNCTIVAL corneoscleral fistula, or as it is termed, a filtering cicatrix, is a much desired end-result in certain operations for glaucoma and the possible danger of late infection can be neglected in view of the relief of hyper-tension afforded by this scar. But in young individuals who carry such a cicatrix as a result of trauma, the danger of infection through the filtering fistula throughout the remainder of their life is an unnecessary risk. Consequently the eradication of such an area of filtration is a measure the risk of which is justified



by the elimination of the danger of future infection. That the risk is not as great as might seem at first blush may be seen by a recital of two such cases.

[1] Read before the Academy of Ophthalmology and Oto-Laryngology, Kansas City, Mo., October 14, 1920.

CASE 1.—A young man of about 23 years came to the Eye Service in General Hospital No. 28, United States Army, for some minor eye complaint. On examination, a one-millimeter corneoscleral subconjunctival fistula was found at the outer limbus of the right eye. There was good subconjunctival filtration as shown by the conjunctival bleb which was about one centimeter in diameter and about two millimeters high. The pupil was distorted and drawn toward the scar, resulting in a pear-shaped pupil, lying horizontally. The remainder of the eye was normal, although the vision was somewhat deficient. The tension was normal.

No history of trauma of any sort could be obtained. The patient did not know of his ocular anomaly and consequently could not place the beginning of the condition. Although it was patently not a congenital anomaly, the time of injury could not be fixed. Incidentally, the patient had the mentality of approximately an eight-year old.

Under local anæsthesia, a large semicircular conjunctival flap with the fistula as a center was dissected free and laid over the cornea, and the fistula laid bare by blunt dissection. A knuckle of iris filled the posterior portion of the fistulous tract while the anterior portion was kept free by aqueous drainage. Eserine was instilled into the conjunctival sac, and with a cyclodialysis spatula an attempt was made to replace the partially prolapsed iris. The iris sphincter contracted promptly, and with the slight mechanical aid an almost round pupil was obtained. The edges of the fistula were curetted lightly with a small sharp knife and a very fine silk suture introduced. The needle was entered into the sclera about one millimeter from the edge of the fistula approximately one half way through the thickness of the sclera. The second bite was taken through the sclera on the opposite edge of the fistula in precisely the same manner, as seen in the accompanying diagram. Tying this suture completely closed the fistula and it was not necessary to make an opening of the anterior chamber on the opposite side of the cornea, as was originally considered, in order to minimize the pressure on the internal side of the fistula. The conjunctival flap was replaced and held in position with two light sutures.

Atropine was instilled and both eyes bandaged. At the daily dressings, both atropine and eserine were used in order to force the maximum pupillary play. After the third day, the conjunctival flap was again laid back and the scleral suture removed, following which the flap was replaced. Healing was uneventful and at the end of ten days the patient was returned to duty. At that time, the fistula was

completely closed, there was no conjunctival bleb, the anterior chamber was of normal depth, and the pupil was nearly round, although still slightly oval in the horizontal diameter. The tension was normal.

CASE 2.—A sixteen-year-old boy was struck in the right eye with the point of a knife in July, 1919. When seen 24 hours later, he presented a moderately injected globe with a clean incised wound through the corneoscleral margin at meridian 110, extending about three millimeters into the sclera and four millimeters into the cornea. There was a prolapse of a small amount of iris, ciliary body, and vitreous into the wound. The vision was mere light perception and projection owing to extensive hemorrhage into the vitreous. The eye was flushed with oxycyanide and the prolapsed tissue replaced as far as possible and the scleral wound closed with one silk suture. Urotropine was administered per os in large quantities, and under the usual local treatment the eye become pale in three weeks.

In May, 1920, the eye was pale (having remained uninjected for nearly a year). Over the site of the wound was a large conjunctival bleb that had been increasing steadily, although but slightly, in size for the past six months. Underneath the bleb was a one-millimeter corneoscleral fistula. The iris was drawn into this fistula so that the pupil presented the picture of a post-operative coloboma, despite the fact that no tissue had been removed after the original injury. The vision with a minus cylinder was but a fraction under normal, although there was a distinct hypotonicity of the eye.

Under local anæsthesia, a large semicircular flap with the fistula as a center was dissected free and the fistula exposed by blunt dissection. Eserine was instilled into the conjunctival sac and an attempt was made with a cyclodialysis spatula to restore the shape and position of the original pupil. But the adhesions holding the pupil were too dense to be broken by such force as was deemed safe to use. Consequently the endeavor to restore the pupil was abandoned and the fistula was closed with a single suture as in the previous case with the exception that the suture was carried through the conjunctiva and tied over the gold plate used by Wiener in his corneal operations. The conjunctival flap was restored into place, the periphery held with two light sutures. All sutures were removed on the third day.

The course of healing was uneventful, and the patient was discharged from the hospital within a week. To date, the conjunctiva over the site of the former fistula has remained flat and there seems to be no drainage from the anterior

chamber. The pupil is still distorted toward the site of the wound and the vision has returned to but a fraction under normal when corrected with a minus cylinder. The anterior chamber is of normal depth and the lens and fundus are normal, as is the intraocular tension.

These two cases illustrate the simplicity of closure of a corneoscleral fistula that is not necessary for the restitution of the balance of intraocular pressure. Although the fistula per se has no influence upon the vision and undoubtedly an eye with such a filtering cicatrix would maintain its integrity throughout the life of the individual, still the danger of infection through the fistula is sufficiently great to warrant the operation and eliminate such a risk.

MINOR PALPEBRAL AND CONJUNCTIVAL AFFECTIONS ASSOCIATED WITH REFRACTIVE AND MUSCULAR ERRORS.[1]

By Dr. JOHN GREEN, Jr., St. Louis, Missouri.

THE major part of the work of any ophthalmic practitioner lies in the fields of refraction and motor anomalies of the eye: probably from 60% to 90% of all who consult us do so because of symptoms arising from uncorrected ametropia or imbalance of the ocular muscles. It goes without saying that each one of us will endeavor, painstakingly, to place upon every patient that particular pair of spectacles which shall aid the eyes to perform the exacting tasks demanded by our complex civilization, and induce in the patient a sense of general well-being and unconsciousness of his ocular apparatus. While the principles underlying the tests are universally understood methods vary, and perhaps, rightly so. "All roads lead to Rome" and equally exact and satisfactory results may be attained by different methods of procedure, adapted to the training and personality of the examiner.

Let us assume, then, that glasses have been prescribed based on a knowledge of the static and dynamic refraction, a determination of the power of accommodation, a prolonged reading test and an estimation and correction (if necessary) of any muscular anomaly (tests being made of the balance for far and near). The routine will include a test of the pupillary reactions an ophthalmoscopic examination and often a mapping of the visual fields. We should inquire into the occupation of the patient and secure some general conception, at least, of his previous state of health and present physical condition.

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[1] Read before American Academy of Ophthalmology and Oto-Laryngology, Kansas City, October, 1920.

Such is the routine which, I presume, most of us follow in the ordinary patient presenting himself with symptoms of asthenopia. We may, in addition, *casually* inspect the lids, ciliary margins, conjunctiva, and cornea, and, failing to find any deviations from the normal, proceed on the assumption that all the patient needs is a properly fitted pair of glasses. Now it is to this "casual" inspection that I venture to raise an objection. Such an inspection often fails to disclose certain minor changes in the lids, conjunctiva, and cornea which may be contributory to the discomfort of the patient; may, indeed, be the sole cause of his complaints. Symptoms arising from these minor disorders,—burning, smarting, itching, stillicidium, foreign body sensation, ocular pain, early fatigue in use, etc.,—closely resemble the symptoms of accommodative and muscular asthenopia. Careful correction of the refraction and any associated muscular trouble must be supplemented by equally careful correction of any conjunctival, corneal, or palpebral disorder. Not every patient with low hyperopia or hyperopic astigmatism requires glasses. Sometimes the symptoms in such patients are due to temporary accommodative weakness incident to recent debilitating illness; they may just as well depend solely on local troubles in the lids, conjunctiva or cornea.

We are all familiar with the conjunctival and slight ciliary congestion, the sensitiveness to light, the epiphora on manipulation, the over-red palpebral margins, which so often occur in the ametropic eye and which disappear when the proper correction is applied. It is not these conditions, so obviously dependent on ametropia, and wholly correctible by glasses, to which I wish to draw your attention. I desire, rather, to discuss certain other abnormalities which, in my opinion, should always be sought for, and if found, removed prior to, or immediately following the refraction test.

As some of these changes are very minute, simple inspection, without magnification, may be insufficient to bring them to light. It is now my invariable practice to inspect the lids and anterior segment of the globe with the Zeiss binocular magnifier, going over, in order, the skin of the lids, the cilia, the intermarginal space, the caruncle, the puncta, the outer angle, the bulbar and palpebral conjunctiva, the upper and lower cul-de-

sacs, and the cornea. Such a minute inspection may seem superfluous in patients whose complaints are *apparently* based solely on their refractive error. Often, indeed, nothing out of the way is found. There is, however, a surprisingly large number who present minor pathologic conditions.

Disorders of the Meibomian Ducts and Glands. Normally, the ducts of the Meibomian glands can be seen through the conjunctiva as narrow white lines running vertically to the palpebral margin. Either by reason of increased secretion or by partial blocking of the orifices in the lid margin, these ducts become dilated and appear as wider lines. Not rarely a large number of these can be observed in the tarsal conjunctiva. Vertical incision with a sharp-pointed canaliculus knife, with pressure and gentle curettage will empty these ducts of their oleaginous or caseous material. Often the blocking occurs near the orifices of the ducts, in which case massage of the palpebral margin will cause the evacuation of the contents. I have found the following manipulation effective: the upper and lower (closed) lids are grasped by the forefinger and thumb of one hand. Thus each lid is partially everted and the tarsal surfaces are apposed. The ducts are emptied by pressure combined with a lateral and antero-posterior sliding motion of one tarsal surface over the other. Occasionally, it may be advisable to apply pressure with the thumbnails.

Occult Chalazia. Very small chalazial masses may not present any elevation, either on the conjunctival or skin surface, and may not be palpable. In such cases, the exact location of the mass is difficult to determine. I have found it of advantage to blanch the conjunctiva thoroughly with a cocain-epinephrin mixture, which will clearly define the area to be incised. The tarsal conjunctiva immediately over the chalazion will appear as a darker ring or oval and can thus be readily differentiated from the uniformly blanched tarsal conjunctiva,

Chalazion the Cause of Epiphora and Astigmatism. On several occasions, I have observed that a small chalazion, situated near the nasal end of the lower lid, has slightly everted the lower punctum, thus causing an annoying epiphora which disappeared after curettage of the chalazial contents. We are all familiar with the fact that a large chalazion, by exerting con-

stant pressure, may so deform the cornea as to produce a transitory but regular astigmatism.

Papillary Elevations of the Tarsal Conjunctiva. Frequently the tarsal conjunctiva, in ametropia, presents minute elevations, which appear most abundantly at the upper tarsal edge, especially toward the inner and outer angles. There is little or no discharge. Usually correction of the ametropia associated with a mild astringent collyrium suffices to smooth out the elevations. If, after a few weeks, they still persist, a mild form of expression by means of Kuhnt's or Gifford's forceps is very effective. A very mild conjunctivitis, with the formation of follicles, similar in type to that incident to atropine and eserin irritations, is occasionally seen in association with hyperopia or hyperopic astigmatism. This condition usually yields rapidly to glasses and astringents. If it does not, the lids should be cocainized and rubbed with gauze dipped in boric acid powder.

Vernal Conjunctivitis. In the severe form the diagnosis is, or should be easy. Unfortunately, it is too often mistaken for trachoma and treated on this assumption. On the other hand the mild form (and there are many cases which give rise to symptoms but show very little to inspection) is apt to be regarded as the conjunctival reaction to ametropia, and hence goes untreated, save for correction of the refraction.

Conjunctivitis Due to Food Anaphylaxis. Recently Conlon (*American Journal of Ophthalmology*, vol. ii., No. 7., July, 1919, page 486) has described a mild, but annoying form of conjunctivitis apparently dependent on the ingestion of certain foods in individuals anaphylactic to these foods.

The protein skin test, as described by Walker in his investigations of the cause of bronchial asthma, is applied. Prompt cure has followed the withholding of the offending food material, with a recurrence of the trouble on the resumption of this food.

Caseous Deposits and Concretions. Rarely in children, more frequently in adults, one finds scattered here and there in the normal appearing tarsal conjunctiva, tiny round light yellow masses. On puncture a small spherical or slightly flattened soft or hard, homogeneous mass, can be lifted out. Sometimes they are adherent to the conjunctiva, again they appear to lie

free in a tiny cavity. Probably they do not, as a rule, give rise to symptoms, but when elevated above the level of the tarsal conjunctiva may evoke the sensation of a foreign body and then require removal.

Similar deposits are more frequently found in elderly people. They appear as white and yellow specks superficially or deeply situated, generally distributed throughout the tarsal conjunctiva, but showing an especial predilection for the upper and lower cul-de-sacs. They are, according to Parsons (*Pathology of the Eye, 1904*, vol. i., page 93) "the products of degeneration of cells and mucoid exudate in the lumen of minute cysts," which are "retention cysts of glands of new formation, due to irritation, and also of the so-called Henle's glands." Each cystic space contains from one to five concretions. They do not contain calcium carbonate or phosphate. Like all such degeneration products, they stain variously and according to Parsons (*Path. of the Eye 1904*, vol. i., page 94) "belong to that indeterminate quantity—Von Recklingshausen's hyalin." As these deposits may project above the surface and are surrounded by an area of lymphocytic infiltration, it is clear that they serve to perpetuate a low grade conjunctival inflammation. The treatment is simple and satisfactory. Under the magnification of the loupe every individual cyst is punctured and its contained masses lifted or curetted out. This is often a very tedious process, as each lid may contain from twenty-five to fifty concretions, and it is important that the work be very thorough. Such lids often contain many blocked Meibomian ducts and the little operation is best concluded by thumb and finger massage of the edge of the lid.

ILLUSTRATIVE CASE. Mr. B., age 60. Complained of "heavy feeling in lids," burning and lacrimation in use. Refraction, R. & L. + .75 sph. V $\frac{6}{6}$. Orthophoria. Bifocals prescribed: R & L + .75 sph. + 2.5 sph. added. Symptoms not improved. Disinclined to wear bifocals. Evacuated half a dozen cysts, removed twenty to thirty concretions from each lid, curetted a small chalazion, and massaged the lid margins. Astringent collyrium of zinc sulphate. Within a week, symptoms improved. After three months, lids normal. Wears bifocals with comfort.

Pinguecula. The vast majority of pingueculæ give rise to no symptoms and require no treatment. In persons exposed to dust, smoke, and other forms of mechanical irritation, these little affairs may have a recurrent inflammation with attendant discomfort. If astringent lotions fail to prevent recurrences, the pinguecula should be excised.

Warts. Small warty growths on the lids or lid margins—verruca senilis—are not at all rare. Sometimes they occupy the intermarginal space. Again one may be found encroaching on or overlapping the sharp inner border of the lid. In such a situation. rapid closure of the lids is apt to bring the rough edge of the wart into contact with the cornea and produce the sensation of a foreign body. Abscission, with cauterization of the base by trichloracetic acid is indicated.

Cysts of Moll's glands are tiny retention cysts which occur at the edge of the lids. A patient is often aware of their presence only by close examination of his lids in the mirror. On the other hand, they may be very annoying by giving rise to a foreign body sensation. They are easily gotten rid of by puncture and pressure-massage. Sometimes the walls of these cysts proliferate, producing more or less solid tumors.

Aberrant Lashes. In lids wholly free from cicatricial changes, and in which there is no distichiasis, I have occasionally observed the presence of a few very fine light colored hairs springing from the lid margin just internal to the normal row of cilia. They tend to curve back and irritate the cornea. They should be destroyed by the electric needle. The lashes at the outer angle may, through spasmodic closure of the lid, be swept backward and caught between the lid and the globe, there to remain until released by a strabismus hook. There is a tendency to recurrence which can usually be overcome by stroking the lashes outward. In one patient a canthoplasty was required. Sometimes a cilium as it emerges from its follicle will burrow under the skin. As it grows, the skin is stretched over it in a tiny tent-like formation. A patient recently observed, who had this condition, stated that her eye felt "drawn" and thought that her glasses needed changing.

Broken off ends of cilia and the short cut ends of the scalp hairs (following a hair-cut) may lodge in the puncta and cause irritation.

Occasionally the tiny hairs of the caruncle grow long, and curving outward and downward, irritate the bulbar conjunctiva.

Foreign Body on the Cornea. Failure carefully to inspect the cornea may lead to the ridiculous attempt to abolish the discomfort arising from an imbedded foreign body with a pair of glasses; such a case has recently been brought to my attention.

Excoriations at the Outer Angle. These little solutions of continuity are often very tiny and may escape detection unless carefully sought for with the loupe. They yield readily to lunar caustic and yellow oxide of mercury.

Spastic Entropion. It should not be forgotten that spastic entropion may not be constantly present and hence may not show during the patient's visit to the office. In the case of elderly persons, I make it a practice to explain the nature of this trouble to the members of the family so that a watch may be kept for the appearance of this annoying condition.

Mild Squamous Blepharitis. The very mild form of this affection is apt to be overlooked. It is so frequently the ocular manifestation of a seborrheic eczema of the skin or scalp that I have found it of great advantage to treat this condition in collaboration with a dermatologist.

I have endeavored to present, as briefly as possible, some of the minor ailments of the anterior ocular segment which may and often do, give rise to ocular discomfort. Some of the symptoms evocable by these ailments are indistinguishable from some of the symptoms due to uncorrected ametropia and muscular defects. A patient's symptom-group may be due partly to these disorders of the lids, conjunctiva or cornea, partly to his need for glasses. Sometimes his discomfort is psychic or dependent upon some general disease. The outspoken conjunctivitis, keratitis, chalazion, etc., makes itself heard and needs no introduction.

If I have been able to arouse your interest in some of the minor disorders, which, though minor, may yet be provocative of great ocular discomfort, the purpose of this paper will have been accomplished.

OPHTHALMOLOGY FROM THE VIEWPOINT OF THE CLINICIAN. WITH THREE ILLUSTRATIVE CASES.

By Dr. HOMER E. SMITH, New York.

Assistant Surgeon, Herman Knapp Memorial Eye Hospital
Visiting Ophthalmologist, New York Diagnostic Clinics.

TO one who has spent half his medical life in clinical medicine and the other half in ophthalmology the two are so indissoluble that he finds it impossible to think in terms of either separately. Perhaps because of his early training he thinks in terms of the former rather than the latter. This method of approach may militate against the refinements of differential ophthalmic diagnoses but it gives a keener insight into the pathologic sequences of the disorder. The medieval concept of disease was based on demoniac possession, the phlogiston theory put an "itis" on every disorganized tissue, but Virchow had prophetic vision when he gave us his cellular pathology, for it is most certainly true that the ultimate decision rests with the germ-cells as to man's physical destiny. To-day diseases are segregated into clinical entities—an illogical division which makes a part greater than the whole. "Diseases are not entities nor even recurrent phases of independent events but are partial aspects of a universal series."[1] The first variation from normality is an aberration in molecular dynamics—here it is that disorder, not disease, begins. The frank and evident manifestations of malfunction are but late aspects of this universal series. Excepting trauma and localized ocular exogenous infections the diseases of the eye are pathologic sequences (of endogenous origin) to septic, toxic, or

[1] Sir Clifford Allbutt, Presidential Address, British Medical Association.

biochemic changes in the cell and are usually but the smaller part of the morbific process. What makes it of paramount importance may not be the underlying disorder but the menace to the vital function of the organ involved. In analyzing conditions which have brought about diseases of the eye in many instances no account can be taken of the ætiologic factor for, in not a few cases, the disorder comes under the caption "of unknown origin." Gout and diabetes are notable examples of diseases of unrecognized causation presenting ocular coincidences. Again there are cases where the secondary lesion is of so serious and permanent a character that no radical improvement can be expected from the removal of the primary cause. There remains a large group of systemic disorders, with ocular disturbances, which do not admit of the removal of the cause because this is no longer active and we are confronted with lesions in a far-advanced and terminal stage for which ameliatory measures only are possible. There are to be considered always the possibility of concurrent maladies. That a patient has a positive Wassermann does not prove by any means that the ocular disorder is luetic. The writer is far from placing implicit trust in either a positive or negative report, and most of all does he distrust a positive reaction in the absence of any clinical evidences of the disease. Too often have patients been condemned to a life-long dread of disaster, and to actually damaging therapeusis, by a serological report which had only for its basis a technical error. It must ever be held in mind that the discovery of a cause which might explain the malady might not represent the lesion of chief importance, and that any examination is incomplete that leaves uninvestigated any possible source of mischief. The following cases are illustrative of the contentions embodied in this essay—only three are given —they could be added to in scores. In fact every serious ocular malady demands the fullest exercise of the clinician's critical faculty. The first case is presented as an example of how the omission of a single line of investigation, even after the diagnosis seemed conclusive and inclusive, would have led to grave error in treatment.

CASE I.—Patient is a native American girl, white, single, age 18. Weaver. Chief complaints—headache, vertigo,

vomiting, debility. Nothing of importance in past or family history nor in the personal up to two years ago. At this time attacks of vomiting, without precedent nausea and independent of the ingestion of food, began and were accompanied by severe headaches which the vomiting did not relieve. At first these attacks were intermittent, shortly they became of daily occurrence and there developed vertigo and incoördination of gait of the cerebellar type to so high a degree that six months ago she was compelled to relinquish her occupation. She occasionally has subjective feelings of numbness on both sides of her face, coldness of extremities, and complains of muscular weakness. She is dyspnœic on slight exertion but there is no precordial distress. The physical examination showed an ill-developed and undernourished condition, but was negative in diagnostic indications. The gastrological investigation, after a test meal, showed no chemic or microscopic departures from the normal. The examination of her blood gave a normal picture and the cell count and the hæmoglobin estimate revealed no anæmia. Her pulse rate was high, 100 p. m., systolic pressure, 100*mm*, Hg diastolic 80, pulse pressure 20. This was suggestive of a hypo-adrenemia, but the endocrine tests showed no reaction. Roentgen examination of chest and abdomen revealed a visceroptosis and the drop heart characteristic of chronic congenital asthenia. The urinary tests and the Wassermann were both negative. Up to this stage, while the alert clinician would have his suspicions aroused, there was nothing brought out explanatory of anything but the general debility and this was due to congenital deficiency of structure. The eye examination showed a corrected vision of $\frac{20}{20}$ in both eyes. Accommodation normal as were the pupillary reactions although both pupils were evenly large and reacted slowly. Fields for form were normal but marked contraction, symmetric, for colors. The ocular rotations were perfectly performed and there was no nystagmus in the primary position, but this could be elicited on extreme lateral rotations and convergence. This was not assumed to be necessarily pathologic. The eye grounds showed bilateral papillœdema—swelling of the disks, 1.3*mm* in right, 2.00*mm* in left. Diagnosis, intracranial neoplasm—probably cerebellar. Treatment advised—subtentorial decompression to relieve symptoms and to save vision. The neurologic summary of Dr. Charles Rosenheck is here given in full. "The history, clinical course and neuro-ophthalmologic findings, clearly indicate the presence of an intracerebral growth. Its exact localization is impossible at present in view of the absence of definite focal symptoms. The moderate cerebellar dysenergia

(ataxia and diadochokinesis) naturally presumes its location to be subtentorial. The absence of frontal lobe symptoms (emotional or intellectual deterioration) precludes this localization notwithstanding that tumors in this region often also induce ataxia. Although patient should receive the benefit of anti-leuetic treatment for some weeks, serious consideration should be given an early decompression to avert impending blindness." The oculist would most likely have been satisfied with such an investigation, but the clinician felt it would not be complete without a stereo-roentgenogram of the skull. This was made. The report says "Destruction of the dorsal sella and the anterior clinoid processes. The roof of the sphenoid is unimpaired." This verified the diagnosis of intracranial tumor and gave positive proof of its location. The absence of pituitary symptoms is common when the whole gland is destroyed, so there were none of these to give a clue to its location. The cerebellar symptoms were pressure or œdema effects and instead of the serious subtentorial operation, which would have given little or no result, the comparatively trivial subtemporal decompression is now clearly indicated.

CASE 2 is presented to illustrate the folly of attributing purely to ocular instabilities concurrent psychic or somatic phenomena and that "neurasthenia"—however satisfying this pseudo-diagnosis may sound to the incompetent practitioner—may be a sentence to close confinement to the unfortunate victim of this medical blunder. The patient—native American—male, white, married, merchant, aged 41. Chief complaint—inability to concentrate the attention when any attempt is made to use the eyes for close work associated with vertigo and confusion of thought. There is nothing in his family or past history, up to three years ago, that has any bearing on the case. He then had what his physician called a "nervous breakdown" and was compelled to give up business. At this time his chief complaint and greatest source of trouble was double vision, the false image being higher than the true—after a prolonged rest this disappeared but on an attempt to resume work aprosexia, vertigo, and confusion became so marked that again business became impossible. He was unable to walk even a block up on the street, as the moving figures induced such vertigo that he would fall unless supported. The psychic effect of all this brought on despondency and reacting upon his physical status his nutrition suffered. His vision O.D. with + 0.25 ⊃ + 0.50 axis 65 equalled $\frac{2}{1}\frac{0}{8}$. O.S. with + 0.25 ⊃ + 0.25 at 90 also equalled $\frac{2}{1}\frac{0}{8}$. With the phorometer he had orthophoria in the distance. Parallax showed a slight left hyper-

exophoria. He had binocular single vision in all parts of the field excepting the left lower lateral. Here he had crossed diplopia, the image belonging to the left eye standing lower. Analyzed, this indicated underaction of the left inferior rectus and an overaction of its synergist, the right superior oblique. He was given his sphero-cylindric correction and superposed upon this, in the infero-temporal quadrant of the left lens, a 3$^{\Delta}$ paster, base down. I then returned him to the referring physician with the following report. "Inasmuch as this patient comes from his former physician with a diagnosis of 'neurasthenia' I am moved to express myself somewhat at length upon my own concept of this confession of incompetency, for in every case I so regard this totally inadequate diagnosis. When there have been eliminated: (1) Dilated or insufficient hearts and especially the type which is characteristic to the congenital astheniac; (2) renal inadequacy, not necessarily expressed by a low urea output or albuminuria, but by a high non-protein nitrogen or creatinin content of the blood; (3) active but obscure pulmonary tuberculosis; (4) larval syphilis; (5) cryptogenetic sepsis; (6) the atypical dyscrinisms and (7) the anæmias—then the cases remaining to be labelled with this pseudo-diagnosis would be very few indeed. I trust you will not think I am attempting to be didactic but believe I am simply expressing my aversion to this deplorable lack of scientific precision. This patient is 41 years old and only within the past three years has the ocular condition, which is frankly an anatomic anomaly, come to the fore as a disturbing factor. It has made itself evident simply because of the nutritional depression incident to one of the causes previously mentioned. To attribute all his symptoms as being purely ocular in origin to my mind is unthinkable. By this I am not to be understood as considering the ocular condition a negligible factor in the case, nor one unworthy of meticulous attention, but to expect a cure from treatment of his eyes alone, be this optical or otherwise, would be unwarranted. To make a comprehensive search into causes there are suggested: A teleroentgenogram of his heart, a stereoroentgenogram of his chest, a blood chemic analysis for creatinin and non-protein nitrogen, a phenolsulphonephthalein test for renal permeability, a search for septic foci, teeth, tonsils, appendix, prostate, gall bladder, kidney. An investigation into an autotoxic condition from intestinal sources, an urinary analysis for indican, the acetone bodies, the urea percentage, the phosphates, chlorids, or any abnormal content or proportion, a cytologic blood examination including a differential count and the hæmoglobin estimate and lastly an investigation into the endocrine functions. The Wasser-

mann tests previously made are reported as negative. This was to be expected as there seems to be no suspicion of a luetic infection. (Here followed the ocular findings as given in detail above.) It is not expected that this searching scrutiny needs to be carried to its ultimate conclusions but only so far as will establish beyond doubt the cause or causes of the disturbed nutrition." The subsequent history is as short as the results were satisfactory. Only part of the investigation needed to be given. The cause was found to be a toxicosis of intestinal origin, and from high colonic lavage, disinfection and localized implantation of the Bacillus Bulgaricus in less than two months the patient was restored to health and the ocular muscle imbalance was no longer in evidence in any part of the field.

CASE 3 is quoted as an illustration how, after a most searching investigation into causes, an evident ophthalmic condition had to be left without adequate explanation. Male, white, native American, widowed, dentist, aged 69, comes with his chief and only complaint of poor vision, which is of such degree that no longer can he see to read or do his work properly. Nothing of importance in his family history. Past history revealed one fact which in the synthesis of the case was considered of prime importance. During boyhood he had so severe an attack of scarlet fever, with associate kidney involvement, that his life was in jeopardy. Following recovery there were symptoms of myocardial inadequacy which were persistent during adolescene. No other facts of importance elicited. Ten years ago noticed failing vision in left eye which gradually passed into complete loss of sight. A few months ago, with the remaining eye, began to be conscious of difficulty in reading and in his work and that distance vision was as looking through a cloud. Vision in the right eye $\frac{10}{200}$, in the left, indeterminate. The ophthalmoscope revealed in the left eye complete primary optic nerve atrophy. In the right over the eye-ground were evenly disposed innumerable small capillary hemorrhages. The nerve head was normal and the blood vessels apparently so as to size, lumen, course, distribution, and absence of perivascular infiltration. These hemorrhages were not the flame-shaped type of uremia nor the discrete droplets of diabetes. Moreover the urine was normal in every particular. The coagulation time of the blood was normal (3.5 minutes) which ruled out hemophilic tendencies and excepting a rather high non-protein nitrogen content the blood examination showed no departure from normality. Leukæmia was thereby eliminated. There was nothing in the eye-grounds or elsewhere to suggest tuberculosis nor were there found any foci of

cryptogenetic sepsis. There remained only two unexplored sources of trouble, viz., syphilis and vascular disturbances. The pulse rate was 69; the systolic blood pressure was 140 *mm* Hg.; diastolic 60; pulse pressure 80. There was a pronounced murmur over the base of the heart with the second sound and a roentgenogram showed a marked aortitis and dilatation of the aortic ring. Inasmuch as 80% of such lesions are syphilitic, a Wassermann was taken, this proving negative a provocative salvarsan injection was made with a like result. At the time of the second test his renal permeability was investigated by the phenolsulphonephthalein test and a minor renal inadequacy established. In percentages, there came through in the first hour, 37 as against a normal of 50 and a total in two hours of 55, as against a normal of 75 to 90. Now have been established a diagnosis of aortic regurgitation, endomyocardial degeneration and renal inadequacy due to scarlatinal infection in boyhood but this leaves the cause or causes of the intraocular hemorrhages in the realm of conjecture. Were these due to capillary stasis, to the back-lash of the high pulse pressure or to biochemic changes in the blood itself? We are left in doubt and also is lacking an explanation why there should have occurred a primary optic nerve atrophy in the other eye. It is axiomatic that there can be no accurate or scientific treatment without precision in diagnosis. Failure in the latter comes about from (a) taking insufficient time to analyze all the possible factors in the case; (b) the considering of secondary effects as primary causes; (c) a premature assumption of the obvious forgetting that the obscure may be of even greater importance; (d) overlooking concurrence of disorders. Ophthalmic diagnosis does not end in nomenclature. A convenient label does not take cognizance of ætiologic factors, pathologic sequences, congenital deficiencies, hereditary tendencies, environmental and occupational influences, nor of collateral and consequent complications. The analyzes of all these do not present insuperable difficulties, but it is in the synthesis, the integration of the data, the rejection of the unimportant, and the correlation of the essential that distinguishes the clinician from the mere practitioner. Even as did the mythical filament lead the hero to the hidden princess so does the ingenious clue of golden thread run through the maze of diagnostic perplexities. To find this clue, to follow it to the end and not be tempted into dubious claustra is that which makes of ophthalmic diagnosis the most fascinating of all pursuits.

REPORT OF THE TRANSACTIONS OF THE OPHTHALMOLOGICAL SECTION OF THE ROYAL SOCIETY OF MEDICINE

By Mr. H. DICKINSON, London.

An ordinary meeting of the Section was held on December 10, 1920, the President, Dr. James Taylor, occupying the chair.

Mr. N. Bishop Harman showed a patient the subject of **leontiasis ossia, unilateral, associated with optic atrophy.** The skiagrams he exhibited showed that the thickening of bone was rather diffuse. The girl had been under observation 2½ years, and the only noticeable change during that time was a slight proptosis of the right eye. The optic atrophy, however, was on the increase. There was now a slight perception of light in the nasal and temporal fields, but the sight had practically gone.

Mr. E. H. E. Stack (Bristol) spoke of a case he had in 1900, the leontiasis affecting the whole head; it had been slowly growing 21 years. He secured half the skull after death, and the noticeable feature was that none of the foramina at the base of the skull were even slightly affected, although vault and face were greatly involved in the change. It was a diffuse bossy leontiasis. At one spot the skull bone was 3 inches thick. There was no interference with brain or nerve function. During visits to a department of the hospital it had been assumed to be a case of hydrocephalus. Death eventually took place from diphtheria. Her head had become so enormous that her forefingers had become dislocated outwards from continually supporting the head, which was her usual resting attitude.

The President considered the special interest of the case was the optic atrophy. He remembered only one similar case,

that of a gentleman he saw 12 years ago who used to come to London every year to procure a larger hat. The subject felt the increasing weight of his head. He was also deformed in certain other ways. He had no headache or optic atrophy; the latter he considered a rare complication.

MR. HARMAN also demonstrated a new scotometer, the chief features of which were the taking of a record on carbon paper, the speed and accuracy with which it could be done, and the hiding of the observer's hand from the patient. Successive observations could be taken on the same chart, which extended 26° laterally, and 17° vertically each way.

He showed, in addition, a frame with vertical adjustment for use in observations on hyperphoria. He said that in certain cases which had unequal eyes there was a false hyperphoria, due to the prismatic action of lenses, which it was difficult to correct for near vision. In this apparatus, one limb was detached from the frame and connected by a telescopic arrangement with a rack-and-pinion, enabling one cell to be shifted above the other. There was a range of 10*mm*, enough to give correction for ordinary hyperphoria.

MR. W. H. MCMULLEN exhibited a Peters campimeter, which he described. The obvious criticism was the very short working distance, and the fact that the field marked out was in the observation of the patient. There were some cases in which it might be useful.

Leprosy of the Conjunctiva.

MR. H. NEAME showed a case of **leprosy involving the conjunctiva.** He said it was a rare kind of case: the last he could find recorded in England were two by Mr. Treacher Collins in 1909, reported in the *Transactions* of the Ophthalmological Society. The patients were father and son, aged respectively 45 and 15, of Polish nationality, though the father had left that country twenty years before, and had noticed nothing amiss with his eye until five years before being seen by Mr. Collins. The boy had had it only two years, and his condition was much more severe. The infection of the patient now being shown occurred in India, and the first indication of the disease was the occurrence of spots on the forearm. He had now a

widely extended eruption over the body. The pupils were fixed, the knee jerks brisk. The voice indicated the presence of a degree of nasal obstruction, and there was a sanious nasal discharge from the ulcerated nasal mucous membrane. In this discharge lepra bacilli were very numerous. The lids and surrounding skin were infiltrated and œdematous. Vision in the right eye was $\frac{6}{18}$, partly improved with a sphere to $\frac{6}{12}$: left $\frac{6}{36}$, improved to $\frac{6}{18}$. There was no improvement with cylinders. The patient had had eight intravenous injections of sodium morrhuate, but without producing any apparent reaction or improvement. Then he had injections of sodium chaulmoograte intravenously, as used by Sir Leonard Rogers, from 1*cc* to 4*cc*. After a somewhat larger injection he had a vigorous reaction two days later. Rogers had a series of very hopeful results from this treatment, especially in leprosy of three years' standing or less. The drug was supposed to act by the bacilli, which, in forming their capsule, absorbed some of the fatty acid, which was inimical to the bacilli's growth. He was continuing the treatment; the patient himself considered there was improvement.

Mr. Treacher Collins spoke of a case in a man from Rangoon, who had a completely opaque cornea on one side, and parenchymatous keratitis on the other, and he was beginning to get nodules on the sclerocorneal margin. Peritomy had been done in his first eye, and the patient thought progress of the disease was delayed by it. The speaker, at the patient's request, did peritomy in the other eye, but it did not make any difference. It was easy to diagnose ocular leprosy from the clinical appearances. Another case was in a boy from Cork, who probably caught it from his father, who had been living in Riga.

Mr. M. S. Mayou said the nasal mucous membrance seemed to be nearly always involved, and cultures from that revealed bacilli in plenty; there was no need to excise a piece of conjunctiva in order to make the diagnosis.

The case was also discussed by Mr. Gray Clegg, Mr. Leslie Paton, and Mr. Traquair.

Mr. Hine exhibited a patient with an **implantation cyst of the iris.** The patient, a woman, had had the cyst twelve years. In 1908 she had a penetrating wound at the limbus of the left

eye from a blow. Iridectomy was done. A month or two later she returned with a pearly looking cyst at the site, along the margin of the coloboma. With a small cylinder she had $\frac{6}{9}$ vision in that eye, and she experienced no trouble from the cyst. Therefore he proposed to leave it alone.

MR. MCMULLEN showed a case of similar nature, with an eight years' history, and several members recorded cases in which the results of operations for these cysts had not been good.

REPORT OF THE PROCEEDINGS OF THE SECTION ON OPHTHALMOLOGY OF THE NEW YORK ACADEMY OF MEDICINE.

By Dr. CONRAD BERENS, Jr., Secretary.

MEETING OF NOVEMBER 15, 1920. DR. A. E. DAVIS, CHAIRMAN.

Doctor Isaac Hartshorne reported a case of **pulsating exophthalmos** in a girl of 12 years, due to a traumatic rupture of the internal carotid in the cavernous sinus which was cured by ligation of the common carotid artery with preservation of vision.

Dr. I. Hartshorne reported on a case of **serous sympathic uveitis** in a girl, 9 years old, who one month previously had stuck scissors into her left eye.

The left eye was soft, slight ciliary injection, pupil eccentric, being pulled to nasal side by anterior synechia. Condition of lens and fundus not seen because of marked photophobia.

The right eye presented photophobia and lacrimation, ciliary congestion. Pupil of medium size and sluggish. Five or six small deposits on Descemet's membrane. The left eye was enucleated.

Treatment of the right eye consisted in hot compresses, atropine; sodium bicarbonate, ten grains t. i. d., were given internally and sodium salicylate was administered during the six weeks in periods of five days with an intervening rest of five days. During the first period 45 grains a day was given, during the second and third 50 grains, during the fourth 30 grains. The weight of the child was 50 pounds. During the last three weeks she was also given hydrarg. cum creta one half grain t. i. d.

Under this treatment the inflammatory symptoms in the

right eye rapidly subsided. The condition in the eye ground cleared up so that at time of discharge, though the disk was still slightly blurred, it was normal in color, and the eye ground was otherwise negative. With corrective glasses vision was $\frac{2}{3}\frac{0}{0}$.

DISCUSSION: DOCTOR DUANE enquired if any cases of poisoning had been noticed with these large doses of the salicylates. He recalled a case in his early hospital experience, in which the medicinal administration of high doses of the salicylates had produced poisoning with the characteristic color of the urine and speedy death.

DOCTOR CLAIBORNE said that while gigantic doses of salicylate of soda might be, and in fact were, of benefit in the treatment of sympathetic ophthalmia, he saw no reason why doses should be regulated by weight rather than individual susceptibility.

DOCTOR WOOTTON said that he thought the dose of the salicylate depended more upon the susceptibility of the patient than upon the body weight and that these two features did not always have a constant ratio. The main point was to push the drug until constitutional results were produced. Before the advent of this treatment, he had never seen a case recover that had been diagnosed as sympathetic ophthalmia; since that time he could remember four of his own cases, so diagnosed, in which recovery took place.

DR. KRUG stated that some years ago he had seen a case of iridocyclitis following an injury, in which there was a positive specific history and positive Wassermann, and that this case recovered under anti-syphilitic treatment. Are all cases of sympathetic iridocyclitis true sympathetic ophthalmia?

DOCTOR COHEN said that he thought that the combination of sodium bicarbonate with the salicylates, might prevent marked toxic affects, and still not interfere with the usefulness of the salicylates.

DOCTOR DAVIS said, in cases of sympathetic ophthalmia where he had resorted to the salicylates, the stomach was upset by the medicine. He frequently resorted to the administration of the salicylates by suspension given by the rectum. In this way the patient could be put fully under the influence of the drug without upsetting the stomach.

DOCTOR BEN WITT KEY reported a case of **relapsing uveitis.**

S. M., male, 21 years of age, on November 7, 1917, while opening a box, a nail struck and penetrated his right eye. The eye was removed one month later and while he complained of weakness and discomfort of the other eye, almost from the time of the accident, it was not until two or three days following enucleation that the vision became cloudy and the eye slightly inflamed and somewhat painful. Under careful treatment the eye improved, but many floating spots would appear and his vision at times would become so reduced he could hardly get about alone. This condition recurred in attacks, the exact number he could not remember because of the irregularity of their occurrence and the tendency for the eye to become worse as soon as treatment was discontinued.

He was seen by me on August 22, 1919, almost two years following the accident. Examination of the right socket elicited nothing abnormal. The left eye presented the typical picture of a low-grade plastic uveitis—slight pericorneal injection; faintly hazy cornea, a Descemetitis of cream-colored spots; anterior chamber deep; iris partly dilated and attached to the lens capsule, almost annular in extent, and the pupillary space covered by a very fine film of plastic exudate. Vision was $\frac{2}{200}$. The media was hazy and there were many fine floating particles in the vitreous, so that the fundus could not be made out. At the Infirmary the regular laboratory tests proved negative, except for a moderate anæmia. X-ray plates of the sinuses and teeth were also negative. T. O. gave a local and general reaction. Hot bathing and atropine locally, and $\frac{1}{1000}$ of a *mg* of T. R. every four days, brought about a gradual recovery, $\frac{4}{10}$ vision, a fairly clear vitreous, the fundus showing a general moth-eaten appearance, the ravages of a low-grade disseminated choroiditis. On November 28, 1919 (two months after his discharge), the eye showed precisely the same picture as that observed at his first visit to me. He was readmitted to the Infirmary December 19, 1919, where the eye gradually recovered as before under the same course of treatment. He was discharged February 13, 1920, with $\frac{4}{10}$ + vision. In spite of continued home treatment he returned on April 15, 1920, presenting the same condition of the eye as that when first seen, and again for the third time in the Infirmary the condition subsided and he was discharged May 4, 1920, with

vision of $\frac{3}{15}$ —. It was then decided that perhaps his home environment and occupation might be the principal factor in bringing on these relapses. He was therefore urged to seek employment on a farm and was fortunate to secure a position where light work out-of-doors was his daily routine. His diet was carefully regulated in an attempt to increase his intake of milk and eggs to the maximum and every effort made to build up his physical strength and resistance. These measures proved to be highly gratifying, because from May to September there was no relapse, during which time he was kept under observation. But on September 25th, he again returned only to show the same low-grade uveal process again active and reducing his vision to $\frac{20}{200}$. He was admitted to the Infirmary at once and for the fourth time has slowly recovered. The eye is now quiet; the plastic exudate entirely disappeared; deposits on Descemet's membrane faintly visible; vitreous fairly clear; fundus, as already described, showing no gross lesion, but a low-grade disseminated choroiditis. In an effort to study his diet and determine even remotely the probability of a hidden focal infection, I referred him to Dr. Ramirez for a protein-sensitization test. The report of this examination shows negative reactions to the common foodstuffs, but a definitely positive reaction to both staphylococcus aureus and streptococcus non-hemolyticus, thereby indicating no particular dietary disturbance, but rather a hidden focus of infection.

May I ask for an expression of opinion as to any further investigation of the ætiology of this case, also as to treatment, including the advisability of an iridectomy. My conclusions have led me to regard this case as one of tuberculous uveitis in which treatment must be extended over a long period of time—excluding the probability of a hidden focal infection, and certainly syphilis, sympathetic ophthalmia, and a dietary or gastrointestinal condition.

DISCUSSION: DOCTOR TYSON asked if the Wassermann had been taken; he received an affirmative reply that it was negative.

DOCTOR CLAIBORNE enquired about the teeth. DOCTOR KEY stated that although X-rays were negative two suspicious teeth had been removed.

DOCTOR BERENS asked if a culture had been made from

the apices of the extracted teeth and received a negative reply.

DOCTOR KEY reported a case of **accommodation in the aphakic eye.**

M. J. H., 60 years of age, had a combined extraction performed in each eye four years ago, 1916. The pupillary spaces are large, clear, and transparent; the iris pillars are in position; no secondary operation being necessary in either eye, so that the posterior lens capsule in each eye remains intact. At this time vision in each eye = $\frac{14}{18} - 2$, with the following correction:

O. D. + 13.50 + 1.75 × 15°.
O. S. + 12.50 + 1.75 × 40°.

and with the same combination he reads the finest Jaeger at 14 in. with either eye, this without facial grimace or apparent muscle effort, the upper lid being lowered in its natural position.

Following the operations, he returned to his previous occupation, and has used his distance glasses constantly for distance and near, never conscious of the need of a special reading glass. I was unaware of this fact until a few days ago when he asked me why I had prescribed reading glasses for him, since he had rarely used them, although his occupation necessitated very consistent and daily use of his eyes at office work. He stated that, when reading, the only difference between the effect of the distance glasses and the reading glasses was, that with the latter print appeared to be magnified.

Everyone here is probably familiar with the usual explanations given for these cases—namely—extraocular muscle compression of the globe which is believed to be an important factor in children; vitreous molding or compression as result of the action of the ciliary meridianal fibers, and possibly supplemented by extraocular muscle effort; pin-point opening or stenopaic slit effect produced by the character of the secondary membrane or by drooping of the lid over the pupillary space almost to the lower pupillary margin; the factor of high visual acuity and the education of this faculty.

DISCUSSION: DOCTOR DUANE said that the apparent accommodation in this case was due probably to the fact that when the patient looked down as he did in reading, the lids drooped

sufficiently to make a stenopaic slit of the pupil, and that in that case, too, the oblique direction of the gaze practically converted the lens into a stronger one. If the patient looked straight forward with the lid raised, it was observed that he could no longer read.

DOCTOR CLAIBORNE spoke of a patient, 60 years old, who was able to read with distance glasses as near as 5½ inches in each eye and used the distance glasses preferably for all reading. There was also considerable range of accommodation. This was not due to the stenopaic closure of the lid because the patient saw equally well with the lids lifted.

DOCTOR DAVIS: Apparent accommodation in the lensless eye, interests me very much. I reported two cases of this nature and gave a complete review of the literature some years ago. There has always been a dispute in these cases, as to whether there is accommodation present or not. Donders always maintained that in aphakia, not the slightest trace of accommodation remains. On the other hand, Förster, Von Gräfe, Loring, and others contended that an accommodation did exist in such eyes. Both of my cases were in aged people where there was a combined extraction. The first case was forty-two years of age and the other, some fifty odd years of age. The first patient could read with his distant glasses without changing their position, Jager's No. 1 from 8 to 20 inches. The second patient, by preference, could read Jager No. 1 from 7 to 8 inches with her distant glasses. In this case, however, the distant glass was very strong + 16 D, combined with + 2.50 cylinder. In each of these cases, though combined extraction was done, there was a fairly narrow pupil of about three millimeters wide at the narrowest point and six to seven millimeters at the broadest point. Most careful tests were made in these cases to ascertain how the patient was able to read at the near point with the distant glasses after the lenses had been removed. The eye lids were held from the eye balls, atropine was instilled into the eyes in order to eliminate any lid pressure or any action of the ciliary muscle, but with the lids held apart, with the atropine in the eye, they could still read Jager No. 1 at the near points indicated above.

The explanation of how they were able to accomplish this feat, may be explained from three points of view. First, rather

narrow pupil. (The late Dr. Loring, however, reported one case, the pupil not narrowed, but being entirely clear, and round who could read from 5½ to 20 inches with the distant glasses.) Second, the magnification of the correcting lens which magnifies the images to about twice the normal size on account of the nodal point being moved forward, thus enlarging the images. Third, these patients learn to interpret diffusion circles on the retina. This is illustrated sometimes in cases of very high hypermetropia where the patient, instead of holding the print far from them, will reverse the process and hold it very close to the eyes, which might lead the unsuspecting ophthalmologist to think that the patient was myopic. Of course, in these cases, the images are very greatly enlarged and the patient can interpret the diffusion circles to better advantage than the smaller images when the print is held far from the eye.

DR. DUANE presented a modified **Prince's rule,** which had been put on the market at the suggestion of Dr. Martin Cohen. Latterly it had been almost impossible to secure the ordinary Prince's rule, and Dr. Cohen had gotten Gall and Lembke to make up a cheap, but satisfactory substitute. The slight modifications suggested by Dr. Duane from his experience were:

(a) The removal from the rule of the scale of ages which was not in accordance with the realities and was of little service anyhow.

(b) A finer graduation at the distal end of the scale (into eights and quarters of diopters).

(c) Placing the zero point not at the proximal end of the scale but about a quarter of an inch from it, so that when this mark was placed, as it should be, at the anterior focus of the eye (practically at the plane of the patient's glasses), the end of the scale could rest against the cheek.

DR. DUANE also showed the form of **accommodation test** that he had come to as the most satisfactory. The accommodation disk with black cloth background, which he had previously described, was difficult to make and expensive. He had found that a simple black line engraved on a small white card served the same purpose. These cards, being furnished very cheaply could be thrown away when soiled. An ordinary spring clip is used as a carrier.

He pointed out the importance of testing the binocular as well as the monocular accommodation. The former is regularly higher than the latter, evidently because in binocular vision the convergence is called into play, thereby stimulating the accommodation. But the difference between the two varies according to varying factors, which should be determined. It is the binocular accommodation that gives us in general our best measure of the most suitable glass, but the monocular accommodation should be tested, too, in order to discover whether there is any difference between the accommodative power of the two eyes, a difference which may have to be taken into consideration in prescribing the glasses.

DR. A. S. TENNER: **Resection of the tarsus and conjunctiva (combined excision) with new instruments and a review of 300 cases.**

Abstract: The indications for operation briefly include all cases of active trachoma with evidences of the formation of cicatricial tissue or those cases with such development of granulation and thickening that the formation of cicatricial tissue is inevitable. If there is pannus, it should be done to relieve the pannus; if there is no pannus, it should be done to prevent the pannus. Local anæsthesia is preferred. The speaker described his method of anæsthesia in detail, the essential feature being the following up of the conjunctiva by the injection, thus dissecting the conjunctiva by fluid instead of by sharp instruments and by this means preventing post-operative adhesions. The forceps and knife designed by Dr. Tenner were shown and their features and advantages described. The results in three hundred cases performed by the speaker in Turkey and Syria during 1919 and 1920 were almost uniformly excellent and he believes that this operation affords the only means of a quick eradication of the disease and of prevention of its consequences and sequelæ.

DISCUSSION: DR. E. TÖRÖK: I received my early training in Ophthalmology in Budapest, Hungary, a country where trachoma was at that time very prevalent. In fact, it became so dangerous to the population that in 1896, the Hungarian Government offered a prize of two thousand crowns, a considerable amount of money then, for the best paper on "Treatment of Trachoma Cases." The prize was awarded to Kuhnt

for his paper on the "Excision Operations" for trachoma, which was published in 1897. From that time on excision operations were used very extensively and during the time I was connected with the Hospital from 1898–1907, several thousands of these operations were performed. The operations performed were "excision of the cul-de-sac," "excision of the tarsus," and the "combined excision of the tarsus and conjunctiva," this latter operation, according to Heisrath, as modified by Kuhnt, commonly called the "Kuhnt-Heisrath" operation. Based on several thousands of excision operations it was found that the excision operation was in most cases beneficial to the patient afflicted with trachoma and it was also ascertained that the so-called cure in trachoma was obtained much quicker after these operations than without them. It was also found that recurrences were less frequent. Our experiences have borne out Kuhnt's observations, namely, that without the excision operation only about 10% recover, while with, the excision operation approximately 50% or 60% do. This refers, of course, to the excision of the fornix and the combined excision of the tarsus and conjunctiva. The beneficial influence the excision of the tarsus has upon a trachomatous trichiasis is well known and I believe not doubted by anyone. It is a well-established fact that this method is the best and the only cure for this condition, and is far superior to any other method.

The indications for these operations, as established, based upon several thousands of these operations are as follows: Excision of the cul-de-sac is indicated where the conjunctiva is hypertrophic, the epithelium is thickened and there are a great number of follicles in the cul-de-sac, which run together into large gelatinous masses, but only in those cases where the tarsus is not seriously affected and infiltrated.

Combined excision in cases similar to the above where the tarsus is also thickened and infiltrated, if it contains follicles, and if it shows a beginning cicatricial contraction. In cases where, in spite of long medical treatment, no improvement has been obtained and there is a pannus present on the cornea, which does not show a tendency to clear up. Where trachoma has caused ptosis. In cases where only one eye is affected, as the short period of recovery resulting with this operation will greatly increase the possibility of keeping the other eye from

becoming infected with trachoma. The excision of the tarsus, of course, is indicated in old trachoma cases, where the tarsus shows cicatricial contraction; eye-lashes trichiasis; conjunctiva is thin, free from infiltration and follicles, and also shows cicatrization.

All three operations were found contraindicated in fresh cases of trachoma, also in very old cases of trachoma where the conjunctiva is greatly shortened and shows signs of beginning xerosis. This latter condition, however, does not contraindicate the excision of the tarsus alone. The excision operations are also contraindicated in cases where not only the tarsal conjunctiva and the cul-de-sac, but also bulbar conjunctiva show a great many follicles. It was found that in quite a number of cases a slight, acute recurrence followed the operation, which manifests itself in a fresh attack of pannus on the cornea, or an increase in the pannus, if it was present before the operation. This pannus, however, usually clears up in a short time.

Medical treatment should always follow the excision operations and the usual treatment of silver nitrate, or bichloride rub should be applied about two weeks after the operation and should be continued for several months afterwards.

Doctor Wootton said that ten years experience with the Heisrath-Kuhnt operation, had confirmed his previous opinion of its great value and that it constituted the only efficient treatment of trachoma in which pannus was present or was imminent. The results were always good and frequently the cure was complete in so far as the pannus was concerned. Relapses were infrequent, generally of slight moment and easily managed. He preferred general anæsthesia.

Doctor Claiborne referred to his paper published in the Archives of Ophthalmology in 1912, wherein he described his operation, and a clamp for holding the lids, which he demonstrated. The clamp had five spikes, one in the center and two on each arm, the instrument being a modification of the Desmarres' clamp. He referred to an instrument of Miss Erhardt's of the New York Eye and Ear Infirmary, which he considered to be inefficient, as he had tried a similar instrument himself in experimentation. He established precedence for the performance of this operation by a special constructed

clamp. With this instrument the operation could be performed in fifteen minutes and practically without any blood; the surgeon could do it without assistance. He pointed out that Dr. Tenner's instrument was practically the same as Miss Erhardt's.

DOCTOR BERENS said that he believed that Miss Erhardt's instrument differed from Doctor Tenner's and Doctor Claiborne's in that it did not have the traction feature of Doctor Tenner's nor the double arms of Doctor Claiborne's.

So far all the discussion has been in favor of tarsal resection; more emphasis should be placed on the non-operative, home and office, treatment of the patient. He is treating two patients, brothers, each of whom has had one eye enucleated as the result of trachoma. The disease has progressed in spite of the tarsal resections, because the patients were not sufficiently impressed with the necessity for frequent treatment continuing long after an apparent cure. Although the corneæ were completely covered by pannus, constant treatment over a period of two years has given these patients useful vision. He has not found it necessary and does not think it advisable to excise the tarsus in trachoma even in the presence of marked pannus, except to correct ptosis. Conditions in a large city differ from those Doctor Tenner encountered, and where patients can be examined and treated daily, nonsurgical treatment should certainly be tried out thoroughly before resorting to operation. Then the latter course will usually be found unnecessary. Education of the patient to the necessity for frequent and long-continued treatment is the most important single factor in the care of trachoma.

DOCTOR COHEN advised that the marginal incision, through conjunctiva and tarsus at the central portion, should be horizontal in order to prevent any deformity. He considered the Heisrath-Kuhnt operation advisable in all cases of trachoma, except when a mucopurulent secretion was present.

DOCTOR GUTTMAN said that he had described this method of anæsthesia 20 years ago.

DR. TENNER, in conclusion, stated that he agreed with Dr. Wootton that keeping the incision in the tarsus always equally distant from the lid border, that is, geometrically parallel, is most important. He believes the knife, which he exhibited to

the meeting, with its small cutting edge enables one to do this far more readily than any other scalpel. The distance from the lid border is not so important and he does not agree with Dr. Cohen that a *2mm* distance is necessary. He regulates the distance by the conditions, saving as much tarsus as possible, and also beveling the incision so that there is more tarsus on the skin side than on the conjunctival.

The forceps shown by Dr. Claiborne has the same disadvantage as the ordinary Desmarres or ring lid clamp, in that its two arms interfere. One of the great points in favor of Dr. Tenner's forceps is that there is no such interference, but on the contrary the operator has a free and open field. The omission of mention of Dr. Claiborne's instrument in the body of Dr. Tenner's article was not intentional, he stated, but an oversight.

Dr. Tenner claims no originality for the method of anæsthesia except as applied to this operation. The ballooning of the conjunctiva, to which Dr. Guttman stated he called attention twenty years ago for its anæsthetic effect, is important in Dr. Tenner's method of tarsal resection, not so much for its anæsthetic effect as for producing dissection of the conjunctiva, lifting it away without any cutting, thus preventing postoperative adhesions.

Dr. M. Uribe Troncoso (**the physiology of Schlemm's canal**) referred to the important researches made to ascertain the physiological nature of the angle of the anterior chamber, and especially of Schlemm's canal.

The prevalent view to-day following Leber's teaching is to consider the canal as a closed venous sinus similar in nature to the sinuses of the dura mater. However, Schwalbe considered it a lymphatic vessel as far back as 1869, but after a protracted discussion in which many observers took part, he relinquished his views in favor of the venous nature of the canal.

In a paper published in 1909, Dr. Uribe Troncoso claimed, as a result of his experiments on the filtration of fluids out of the eye, that the Schlemm canal was a lymphatic vessel. In a second paper in 1914, this view was supported with new physiological researches.

The anatomy of the angle and especially its vascular supply and the connections of the Schlemm canal with the venous

plexus were studied in an important monograph by L. Maggiore of Rome, in 1917. He described a new intrascleral venous plexus near the edge of the cornea and settled the question of the shape and caliber of the small tubes connecting the canal with the venous branches. These he calls "collectors" and considered them as mere fissures between the scleral fibers, formed only by an endothelial lining and with virtual lumen. Being inserted obliquely to the canal, they really act as valves preventing the blood from the venous plexus entering the canal when the general blood pressure is normal. When this is increased the blood corpuscles can force the barrier made by the collectors and fill the canal. Schlemm's canal has not the structure of a vein, for there is no question of a proper wall, being only a closed plexus formed into spaces excavated in the sclera lined by endothelium.

Dr. Uribe Troncoso then described his own experiments, which consist in cutting and dissecting the conjunctiva around the limbus of a living rabbit, passing the anterior segment of the eye through a rubber dam membrane, and turning the animal on the side in such a position that the apex of the cornea is the lowest point of the eye. This is then immersed in a glass cup containing olive oil during a half or one hour's time. From the cut ends of the perikeratic venous plexus and the anterior ciliary veins, blood comes out at first, then coagulates, and a clear, transparent fluid leaks out, which can be collected and the amount of clot and serum compared with pure blood taken from the rabbit's ear; the rest being pure lymph.

As all the venous branches inside the sclera are either directly or indirectly in connection with Schlemm's canal, if clear lymph leaks from their cut ends instead of blood, the canal itself must contain lymph; in the same way that if a faucet is opened, or a pipe cut through, the liquid which fills the latter will come out. If the canal and episcleral veins should contain blood this will be found almost pure in the oil.

The best way to settle this physiological problem was, of course, direct observation of the canal; but this being concealed by the opaque edge of the sclera remained invisible.

In 1907 Trantas undertook the ophthalmoscopic examination of the irido-corneal angle, but to Saltzmann (1914–1915) belongs the credit for having perfected this method by the use

of a contact glass placed on the cornea, making the accurate observation of normal eyes easy.

Saltzmann after numerous examinations declared the canal to be filled with a clear liquid and not with blood, as Leber had asserted. It is only in strong hyperæmia of the anterior segment or in pathological conditions that the author was able to see a reddish ring around the sclera. Even then the color was not indicative of pure blood, but only of a diluted liquid.

This year Koeppe, of Halle, using the Nernst-Gullstrand slit lamp and a new Zeiss stereoscopic instrument called "Bitumi" for indirect and "Ortobitumi" for direct examination, was able to see the angle with high magnifications in normal and pathological eyes. He also found the Schlemm canal to contain a clear liquid.

These demonstrations settle, according to Uribe Troncoso, the physiological problem, and henceforth Schlemm's canal must be considered as a lympathic plexus containing almost pure aqueous humor.

Dr. W. McLean: The subject of the physiology of Schlemm's canal is indeed a very important one, and as the essayist has said, it has been the prolific source of many interesting researches and still more divergent opinions, and to the present day there is still much to be learned of this important structure.

Ophthalmology owes Dr. Troncoso a debt of gratitude for his efforts to clarify our knowledge of this angle by his researches. Why is ophthalmology so interested in this little structure, the so-called angle of filtration? It is because it is believed to have bearing on the production of glaucoma.

The particular part of the physiology of Schlemm's canal considered in this paper is whether this canal is to be considered as a venous or a lymphatic channel. To arrive at a correct solution of this question we should first answer the questions: What is a venous channel, and what is a lymphatic channel, and what is lymph? Kirke's physiology defines lymph as "an alkaline fluid with a sp. gr. of about 1015. It is like blood plasma in composition, only diluted so far as its proteid constituents are concerned. The proteids present are fibrinogen, serum globulin, and serum albumen and the salts are the same

and present in the same amounts as in the blood plasma, etc." In other words it is blood minus the corpuscles.

Physiology and chemistry have taught us that the aqueous fluid is a modified lymph. It seems to have been settled beyond dispute that the aqueous, at least in part, passes from the anterior chamber by way of spaces in the pectinate ligament, the spaces of Fontana, and that those spaces communicate with the canal of Schlemm. Anatomically the canal of Schlemm is similar to lymphatic channels, that is it does not contain a definite wall structure, but is merely a space or spaces within the scleral ring lined by a single layer of endothelial cells. Thus it would appear that the canal of Schlemm is a lymphatic channel because anatomically it is similar in structure to the lymphatics, and physiologically its lumen seems to be filled with fluid derived from the anterior chamber which we generally consider to be a lymph fluid.

On the other hand Thomson Henderson makes the statement in one of his writings on this subject that in examination of between two thousand and three thousand microscopical slides of serial sections of this structure of the eye every perforating anterior vein or its branches connects with the canal of Schlemm either by an afferent or efferent vessel, and some of these veins have both afferent and efferent connections to the canal of Schlemm. It is considered that either on account of the small caliber of these afferent and efferent vessels, or on account of the presence of valves, in the normal physiological state blood corpuscles are prevented from passing from the veins to Schlemm's canal, because it is only in pathological conditions that one finds blood corpuscles, at least to any considerable amount, in this canal.

The question is then shall we consider Schlemm's canal a venous or a lymphatic channel? If we consider it from the standpoint of what it contains, then it will be called lymphatic, but if considered from the standpoint of its connections then it would appear to be classed as a venous channel. Thomson Henderson classes it as a venous channel.

It is not quite clear in my mind just where and how deep the author makes incisions in connection with his experiment on the eye of the rabbit, and I do not understand why, if incisions are made in the sclera in the region of Schlemm's canal,

no blood transudes, as with the microscope one is able to see veins in this region which are filled with blood corpuscles. The only explanation for the absence of corpuscles from these cut surfaces is that Dr. Troncoso first wipes away all bleeding and clots and after the bleeding stops adjusts a rubber tissue to hold back any conjunctival hemorrhage. After this is accomplished the eye is let into an oily solution and the filtration or transudation of the lymph observed. Is not the time consumed in the preparation of the rabbit for the rubber dam sufficient to stop the flow of corpuscles the same as occurs in an ordinary bleeding, and then by immersing the cut surfaces in the oil the complete sealing of the flow is prevented and thus the lymph transudes from the cut surfaces. A condition very similar to this occurs in small skin incisions, and by gently wiping away the fibrinous clot formed from the lymph of the blood an oozing of a clear liquid can be observed for a considerable time.

I would suggest that the author to verify his experiment denude a portion of the rabbit's ear and after the initial bleeding has ceased that denuded surface be immersed in oil and note if a transuding of fluid occurs, and if so wherein does this differ from the fluid collected from the denuded surface of the eye.

The essayist refers to the observations of Koeppe with the binocular microscope and the illumination by the Nernst slit lamp and says that these observations confirm the lymphatic theory. This method of studying the microscopical anatomy and following the functions of the eye is very interesting and has already opened new avenues for study and thought. There are some interesting writings by Koeppe, Voght, Gallemaerts, and Kleefeld showing progress made with this method of observation. I have made use of this method to some extent but unfortunately I do not possess an illuminating apparatus equal to the Nernst slit lamp, so my observations to the present time are not entirely satisfactory. I have tried to get a Nernst lamp but do not know of any to be had at present in this country. In the observations I have made of this angle by using this method I have been unable to note any coloration in the region of Schlemm's canal, but as I have said my illuminating apparatus is not yet perfect.

DOCTOR COHEN requested information regarding Maggiore's experiments. 1. How many human eyes were examined microscopically? 2. What hardening solution was used in fixation? 3. If serial sections were studied in the human series.

CORRESPONDENCE.

Foreign Proteids in Treatment of Iridocyclitis.

Boston, Mass., January 22, 1921.

Editor Archives of Ophthalmology.

Dear Sir:

The paper of Drs. Wiener and Bonime in your January issue, on the treatment of a single case of sympathetic uveitis with foreign proteins, prompts me to give a brief account of my own experience with this method of treatment. I desire first, however, to express my opinion that the case they report was in all probability not one of sympathetic uveitis. The patient had repeated attacks of iridocyclitis in the left eye for six years before the right eye became affected. None of these attacks could have been of the nature of sympathetic inflammation, otherwise the right eye necessarily must have been simultaneously affected, judging by what we know of this disease. It is inconceivable to me also that the left eye could have vision of $\frac{20}{30}$ after being subjected to repeated attacks of sympathogenic inflammation for ten years. Even if it is admitted that the case was one of sympathetic uveitis, it would have been such an extremely unusual one that it would be unsafe to draw any conclusions from it in regard to the treatment of sympathetic uveitis in general.

I have now employed non-specific foreign protein treatment of various eye diseases for over seven years. The idea was suggested to me by a statement made by Dr. Herbert Harlan in a discussion on interstitial keratitis before the American Ophthalmological Society in 1913. He stated that he had observed a number of cases of this disease in which an intercurrent attack of measles had produced remarkably beneficial

effects. It immediately occurred to me that these beneficial effects were in all probability not due to any specific reaction, but to a general systemic reaction which enhanced all the factors of immunity in the body. I therefore endeavored at once to treat cases along this line. I first tried injections of mallein, but found that too great a quantity was required to produce a reaction. I then decided to try ordinary bacterial toxins, and finding that the most readily available were Coley's toxins, used for the treatment of sarcoma, I made use of these. In the beginning, I treated only cases of interstitial keratitis in this way. In all cases I gave subcutaneous injections sufficient repeatedly to raise the temperature, produce marked leucocytosis, and give local reactions at the sites of injection. In one case I obtained a febrile reaction of 105°, and in another a leucocytosis of fifty-two thousand. Most of the cases seemed to improve on this treatment, but after employing it in all such cases for two years, I concluded that the ultimate results were little if any better than those formerly obtained without it, and that the pain and discomfort were too great to justify its continuance, at least as routine treatment. In the meantime, I had begun to employ it in the treatment of cases of chronic iridocyclitis, and still continue to do so. In some of these cases, in which other treatment has failed, marked improvement has followed its use. I have also employed it in a few cases of chronic anterior intraocular tuberculosis. In these I have found that it would sometimes produce a focal reaction in the eye followed by improvement, just as after the use of tuberculin. These cases, however, were no doubt such as would have ultimately done as well without this treatment. For severe cases of intraocular tuberculosis I have not dared to use it, fearing it might do harm, and feeling sure that it would be of no more benefit than tuberculin treatment, which means, in my opinion, that it would be of no benefit at all.

In the treatment of sympathetic uveitis I began to employ this method of treatment in 1915, and altogether have used it in seven cases. Clinically these were all typical cases, and in four of them I had opportunity to examine the exciting eye microscopically and thus make the diagnosis certain. Three cases were of the serous type, and in each of these normal vision was obtained. Such cases, however, generally do well anyway.

A case that was moderately severe, vision being reduced to the counting of fingers, ultimately, after two prolonged courses of treatment, obtained vision of $\frac{20}{200}$. The other three cases were very severe from the outset. One did not respond at all to the treatment, another improved temporarily but the eye also ultimately became blind. The remaining case, in which the uveitis began about six weeks after cataract extraction, is still under my observation. The exciting eye was not removed because it had vision of $\frac{20}{15}$ at the onset. Both eyes have been more or less active for almost two years, with marked acute exacerbations and great pain. The first course of treatment with Coley's toxins, lasting two months, was begun two weeks after the onset, the diagnosis at first being somewhat uncertain. This seemed to be of considerable benefit, but a violent relapse soon occurred and a second course of treatment lasting six weeks was given which again seemed to be of benefit. A temperature of over 103° and leucocytosis of twenty-two thousand were obtained several times. Since then frequent relapses have occurred and both eyes are soft and practically blind.

In all of these cases of sympathetic uveitis treatment with large doses of salicylates intermitted with mercurial inunctions was employed in addition to the Coley's toxins. In the last case, six injections of neosalvarsan were recently given, without benefit. In the severe case which did not respond at all to Coley's toxins, injections of typhoid vaccines were employed about a year ago also without beneficial results.

Since in all these cases Coley's toxins produced marked febrile reactions, leucocytosis, and local reactions at the sites of injection, there is no good reason to believe that any other non-specific foreign protein would have given better results. It seems to me that if in any chronic disease, a course of such treatment, lasting about six weeks, does not eradicate the causative factor, it is hopeless to expect any permanent benefit, for the effects of the injections, compared to the chronicity of the disease, are, of course, relatively temporary.

The treatment in no case produced any serious untoward effects, although in one patient it produced a marked exudative dermatitis. Judging by my experience, therefore, treatment of sympathetic uveitis by injections of foreign proteins is of very

doubtful value and certainly cannot be regarded as a radical cure for the disease. In the treatment of certain forms of iridocyclitis, however, such injections seem to be of considerable value but should not be used to the exclusion of other forms of treatment, including especially the removal of any discoverable foci of infection. Possibly in some cases Coley's toxins may have a specific effect, since probably many cases of iridocyclitis are due to streptococcus infections.

Very truly yours,

F. H. VERHOEFF.

NOTICES.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

PRESIDENT: J. HERBERT FISHER, F.R.C.S.

ANNUAL CONGRESS, 1921.

The next Annual Congress of the Society will be held on Thursday, Friday, and Saturday, 5th, 6th, and 7th of May, 1921, at the **Royal Society of Medicine, 1, Wimpole Street, W. 1.**

The arrangements will be as follows:

THURSDAY, MAY 5th.

MORNING.

10 A.M. to 12.30 P.M. ... **President's Opening Address.**
Papers:—MR. MAITLAND RAMSAY: "A Case of Cyclitis Associated with Swelling of the Parotid Glands."

AFTERNOON.

2.15 P.M. ... ... Discussion on "The Psychology of Vision in Health and Disease." To be opened by Prof. C. SPEARMAN, F.R.S., and Sir F. W. MOTT, K.B.E. The following also intend to speak: Mr. J. H. PARSONS, C.B.E., and Sir ROBERT ARMSTRONG-JONES, M.D.

AFTERNOON.

5 P.M. ... ... BOWMAN LECTURE by Mr. E. TREACHER COLLINS: "Changes in the Visual Organs Correlated with the Adoption of Arboreal Life and the Assumption of the Erect Posture."

Members will dine together in the evening.

FRIDAY, MAY 6th.

MORNING.

10 A.M. ... ... Discussion on "The Treatment of Manifest Concomitant Strabismus." To be opened by Mr. C. WORTH and Mr. A. J. BALLANTYNE. The following also intend to speak: Mr. E. E. MADDOX and Sir ARNOLD LAWSON.

AFTERNOON.

2.30 P.M. ... ... **Visit to St. Thomas's Hospital, Westminster Bridge.**

Clinical Meeting. Members are invited to show cases of interest. The Hospital will be open for inspection, and the Medical Staff will contribute exhibits.

EVENING.

8.30 P.M. ... ... Papers:—Lieut.-Col. H. HERBERT: "Results of the Iris-prolapse Operation for Glaucoma."

SATURDAY, MAY 7th.

MORNING.

10 A.M. ... ... Business Meeting.
Papers.

The optophone will be demonstrated in the Bowman Library during the Congress.

Members desirous of reading Papers, showing Cases, or taking part in the Discussions, are requested to communicate as soon as possible with Mr. F. A. JULER, 14, Portland Place, London, W. I.

Papers and Communications, subject to the judgment of the Council, will be printed in full in the *Transactions*.

Under the Bye-laws readers of Papers must not exceed twenty minutes, subsequent speakers ten minutes. The openers of the Discussions are allowed twenty minutes.

All Communications must be typewritten.

R. R. JAMES
F. A. JULER } *Hon. Secs.*

OXFORD OPHTHALMOLOGICAL CONGRESS.

Master, SYDNEY STEPHENSON.
Deputy Master, PHILIP H. ADAMS.
Hon. Treasurer, SIR ANDERSON CRITCHETT, BART., K.C.V.O.
Hon. Secretary, BERNARD CRIDLAND, Salisbury House, Wolverhampton.
Past Master, THE LATE ROBERT W. DOYNE.

February, 1921.

PRELIMINARY NOTICE.

The Oxford Ophthalmological Congress will assemble at Keble College, Oxford, on the evening of **Wednesday, July 6th** next, and the Meeting will be held on **Thursday, July 7th,** and **Friday, July 8th,** with an extension to the morning of **Saturday, July 9th,** should the program of the proceedings demand it.

On Thursday, July 7th, a discussion on "THE CAUSES OF INFECTION AFTER EXTRACTION OF SENILE CATARACT" will take place, to be opened by Dr. Victor Morax, of Paris.

Members intending to take part in the Discussion are requested to kindly send in their names to the Hon. Secretary at their early convenience.

The Doyne Memorial Lecture will be delivered on the morning of Friday, July 8th, by Ernest E. Maddox, Esquire, M.D., F.R.C.S.E., the subject being "HETEROPHORIA."

The Official Dinner of the Congress will take place on the evening of Thursday the 7th, in the Hall of Keble College.

A General Meeting will be held during the Congress at a time of which due notice will be given in the final program.

It is hoped that members will contribute to the success of the Meeting with papers, pathological specimens, new operations, cases, or novelties of any kind.

Notification of such at the earliest opportunity to the undersigned will be appreciated.

BERNARD CRIDLAND,
Hon. Secretary.

Salisbury House,
Wolverhampton.

MEETING OF THE VIENNA OPHTHALMOLOGICAL SOCIETY, AUGUST 4 TO 6, 1921.

As there will be no meeting of the German Ophthalmological Society in Heidelberg this year, the *Vienna Ophthalmological Society* has decided to hold an extraordinary meeting in Vienna on August 4th to 6th.

"*The efficacy of the new operations for the relief of glaucoma, compared with the classical iridectomy of von Graefe,*" will be the subject for the first day of the congress, Thursday, August 4th, at 9 A.M. The introductory addresses on the clinical aspect will be given by Professor Uhthoff and on the theoretical and anatomical aspects by Professor Wessely.

The titles of papers and demonstrations are to be sent in not later than June 15th to the secretary, Dr. H. Lauber, Vienna VIII, Alserstrasse 25. The time limit for a paper is fifteen minutes, for a demonstration five minutes. It is understood that no papers are to be presented which have previously been published. The papers and remarks, together with simple

illustrations, are to be handed to the secretary before the close of the session.

The dues for those who are not Austrian members will be twenty marks, which is to be sent to Rheinische Kreditbank Filiale Heidelberg, unter Konto Prof. Dr. J. Meller. The transactions of the meeting will be sent to the members by the publishers at a reduction of 20%. It is very important that those who will attend shall signify their intention to Dr. R. Kramer, Vienna VIII, Kochgasse 25, who will look after suitable lodgings.

(Signed) PROF. DR. J. MELLER.

Professor Fuchs, who is at present in Barcelona, writes that colleagues from the recently belligerent countries, particularly Americans, are cordially invited.